AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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New Cutting-off Machines.

We illustrate herewith three sizes of machines for cutting off iron and steel bars, viz.: 1½ inch, hand feeding, 2½ inch, hand feeding, and 4 inch, power feeding. These machines are designed for use in machine shops, or rolling mills, where stock is cut to length.

We do not propose to write an advertisement of the machines, but we must embrace the present opportunity of offering some practical remarks on cutting off stock for machine work.

This operation, we think, is one far behind almost every other one in modern practice, and strangely in contrast with other improvements, to save money and time, which are met with on every hand.

The common method of cutting off is to send a measure or drawing to the smith's shop, where the bars are first heated and then "chiseled off" something near the finished length, leaving enough for finishing the ends or cutting out. The whole operation consists of three parts, namely, heating, cutting off, and finishing afterwards; either one of which processes will cost as much as to cut the same bars when cold in a machine, as shown above.

The ends are made true, and require no facing down with side tools; the pieces, when cut, are of an exact length, and the centers, when made, are not again disturbed.

We might go on to name many other points, such as contrasting the wages of a blacksmith and helper with the expense of a boy who can operate a good cutting-off machine quite as well as a skilled man; but the whole can be summed up in the remark that the expenses of cutting off, all things considered, are in the two cases about as three to one.

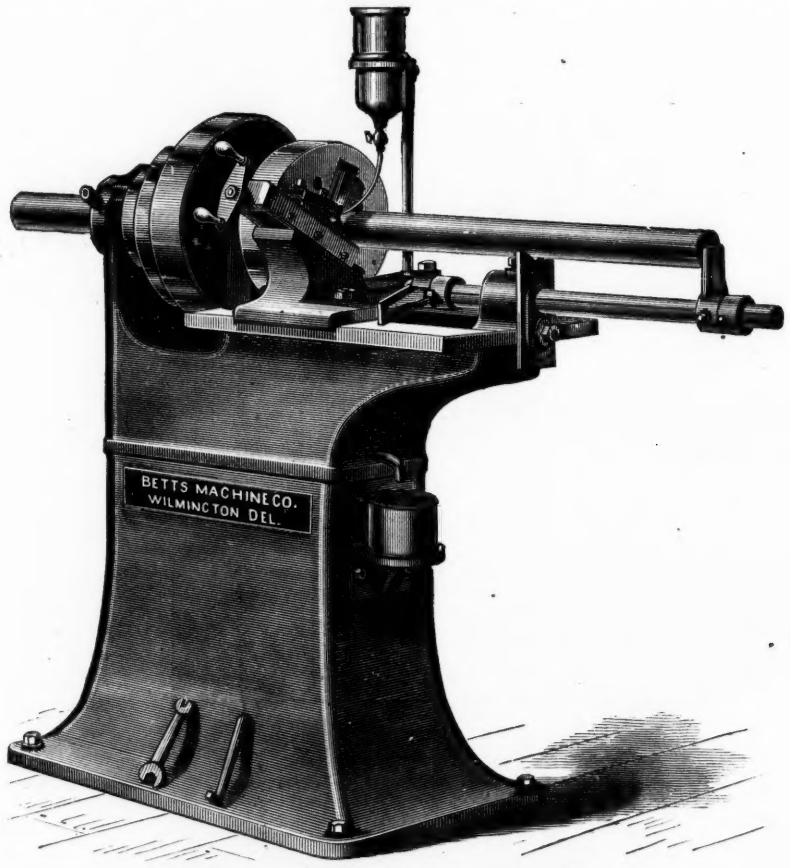
These machines seem to us to be well designed, compact, and are said to be efficient: they are made self-acting or of hand feed, and of various sizes, as shown in the illustrations.

A feature of considerable importance, in operating these machines, is in the manner in which the tools are inserted and clamped to admit of being readily adjusted. The tools are made of an uniform section back, with proper clearance on the sides, and require to be ground on the end only.

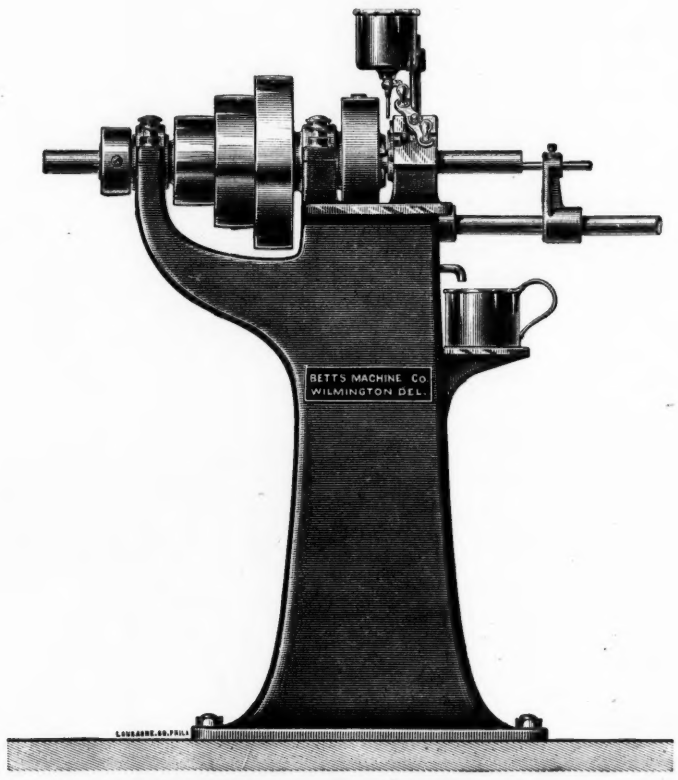
The time required to cut off iron and steel of different diameters has become an important element in the use of this class of machines, and the makers have in preparation a table of the results of different trials of the machines for a continuous working time. This will be published when complete, and no doubt will be a matter of general interest.

Theoretically, the number of revolutions of the spindle of the machine should increase, during the time that a piece is being cut-off, to give the most favorable results, by keeping a uniform cutting speed at the point of the tool. The makers have partially assisted in this matter by arranging pulleys on the counter-shaft so that the speed can be altered without changing the cone belt, while the machine is in operation.

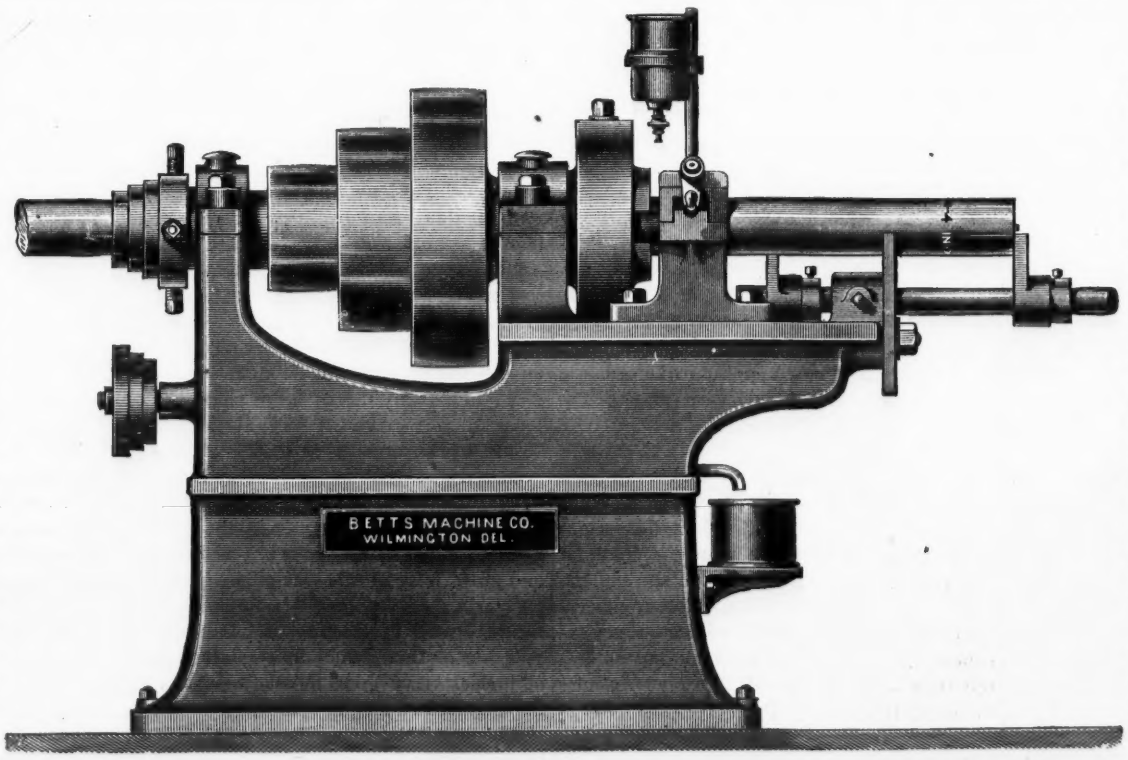
These machines are made at the works of the Betts Machine Co., of Wilmington, Del., successors to the American Standard Gauge and Tool Works, of Philadelphia.



2½ Inch Cutting-off Machine—Hand Feeding.



1½ Inch Cutting off Machine—Hand Feeding.



4 Inch Cutting-off Machine—Power Feeding

There are two distinct methods of building machinery where a number of pieces are to be made of the same dimensions: one is to make the parts interchangeable by means of standard gauges, templets and special tools; the other is to follow the patterns as near as possible, scraping and filing to make a fit. By the former method more accurate and reliable machinery is produced and at less original cost. The old-fashioned plan of making pieces fit by trial is laborious and expensive, yet is followed by a majority of shops where machinery is made up in quantities for sale. The modern plan is every way superior to the old, and in no shop where it has been adopted is there a desire to go back to primitive methods.

The success of American sewing machines, fire-arms, watches, locomotives, and small tools, is in a great degree due to the system of building them with perfectly interchangeable parts. The advantage of this system is be-

coming recognized in Europe, but their shops are slower in making improvements than those of our own country.

Improved Portable Engine.

We illustrate this week on two opposite pages Bradford's Excelsior Portable Engine and an agricultural engine, both manufactured by the Watertown Steam Engine Co., whose warehouse in this city is at 91 Liberty Street, in charge of Mr. Edward P. Hampson. In the Excelsior engine the dome of the boiler contains the heater—the base of the cylinder being joined to the top of the dome by a large planed surface. The heat of the boiler is imparted to the cylinder which, being lagged also with close fitting iron staves, effectually checks condensation of steam, and makes the engine very economical in the use of steam and fuel. The wrought shaft having double crank and carrying two pulleys, the frame bears the two main boxes, and is joined to the cylinder so the strain is central, thus avoiding the side strain which single pulley side engines are subject to. These engines are furnished complete with all attachments, and every boiler is fully tested before leaving the shop. There is no part of either boiler or engine that cannot be removed, examined and replaced in a very brief time. The frame cylinder head-guides and boxes for main shaft are cast in one piece, avoiding all strain, and rendering it next to impossible for these parts to work out of line. The boilers are well proportioned, are large and strongly made. All of them are fitted with "pop" safety valves which are as reliable as a steam gauge. If the belt breaks or runs off, the governor stops the engine at once without jar or strain. The speed is adjustable, and can be changed to suit the work, 100 turns faster or slower without stopping the engine. All parts of the engine are interchangeable and can be duplicated at any time.

The agricultural engine does not differ in the essential features from the one above described. It is mounted upon wheels for transportation, and the governor is provided with a spring balance operated by a band wheel, which instantly changes and adjusts the speed, as required, without stopping the engine. It is claimed that no other engine possesses this feature.

Extracts from Chordal's Letters.

Mr. Editor:

* * * * I have been comparing the advertising systems of several shops, and find more satisfaction in the investigation than I hoped for.

By advertising I mean mail advertising, and have no reference whatever to newspaper processes. When a shop gets its product reduced to something uniform, it, of course, proceeds to let its probable patrons know about the matter. Circulars regarding the subject constitute one plan, and that plan is the subject of my inquiries. I find that shops which have got the thing down to a system, look at circulars in two different lights. First, as an announcement to somebody; second, as a reply to somebody's inquiry.

Printed matter relating to machinery must be illustrated, and the character of these illustrations is an important element in the main question. The builders of machine tools will probably furnish better examples of uniform and systematic circular work than any other class, and I will make use of them for the good of the craft. William Sellers & Co., and Wm. B. Bement & Son, of Philadelphia, send descriptive matter relating to their product in reply to specific inquiry only, I think. They send photographs of uniform size, pasted on a specification of regular size and form. The photos. are what are known as half size, measuring about 3½ by 5½ in., and are excellent prints from excellent negatives, the pink ground prints from Bements' being in my estimation the finest machine photos. ever issued. Such photographs show a machine to the best advantage, and are a credit to the builders, and besides that an inquirer forms the impression that he is looking at a picture of the real thing and not the ideal.

Now for the disadvantages of the photo. system. First the cost,—negative three dollars, three more for stopping out, and six or more cents for each print or mount. A few six cent photos. to an earnest inquirer is not extravagance, but such a price prohibits mailing photos. not specifically asked for, or to put it in other words, absolutely prohibits the use of the photo. system as a plan of advertising. Of the desirability of such virtue in such matter there can be no doubt, and photos. only fulfill such a function when an inquirer has a full set of them.

This brings up another feature of the photo. system. Not one man out of fifty can preserve the elegant and expensive picture six months. They will not enter an envelope, they won't fit pigeon holes in a desk, they won't go into any pocket-book or wallet. A scrap-book is the only hope, and not one man in a hundred has the time, deftness, patience, and love of system to organize a decent scrap-book.

Tool builders have found these things out, and the New York Steam Engine Co. at one time sent out to master mechanics a natty looking scrap-book, containing prints of their entire product with room for more prints, and Bement & Son send to some customers a fair looking scrap-book with many or few prints, and expect the patrons to keep the thing in shape as more photos are sent.

The thing fails half the time, and these albums get robbed of the photos. and get filled up with business cards, photographs of actresses, and stale Pinafore jokes. If a photograph had no other vices, its incorrigible tendency to curl up ought to damn it for business purposes. The Pratt & Whitney Co. fix the curl tendency and the awkward size by mounting the prints on cards like a *carte de visite*, with the specification and price on the back.

This is bad again, for the real scrap-book organizer finds he cannot paste them in without hiding the back which is as important as the front. A common photograph album is tried and worn out in endeavors to get the cards out to see the backs. Photographs, in connection with the machine business, are excellent to serve on real probable customers, but they are too expensive to serve in lots, too every-thing to be preserved, and too expensive to replace if an admirer says he has lost some.

Lithographs have been tried and abandoned. They cost too much, won't work with letter press, and require too thick paper to paste on letter press mounts. Heliotypes are not yet far enough advanced in the art to be worthy of consideration.

Next comes that stand-by, the wood cut. Here we have a high first cost, but no cost for prints and a power of duplication by electrotypes.

If made from an untouched photographed or on a silvered block, the detail will be good, if good work be paid for, and in most cases the detail will be far more satisfactory to the average inquirer than any photograph. If some brilliant artist sketches the machine, the perspective will be "off," but he can distract attention from this by putting in the preoccupied figure of a left-handed man. Four hundred photographs pay for a good cut.

The cut being made, how shall it be used? Take the usual photo., mount and print the picture on it? That would be bad, for such a circular would not be preserved with its fellows. If but one circular is issued its size makes little difference, but if a product is extensive the circulars should be uniform. The same old scrap-book question comes up. What's the use of a lot of separate circulars anyhow? With photographs, cost prevented advertising, but with cut work the expense dwindles, and it is possible to send any inquirer descriptions of the entire product without danger of bankruptcy. By such a plan a customer may be led into ordering something he never before knew was made, and never would have known it if photographs had been depended on.

A full batch of uniform circulars sent to an engineer becomes a catalogue, and may teach him many things he never knew and never sought to know; and this knowledge results to the advantage of the cataloguer. A bound catalogue is the best and cheapest device for furnishing an inquirer with facts and figures. Size comes into the question again Most catalogue work is 8vo. size, and uniformity in this size aids a person in preserving catalogues for reference. They can be bound in volumes and indexed, and will thus do their circulators good long after odd sizes have gone to the waste basket. Such a sized catalogue folds once and mails nicely, and in the same shape will be carried in the recipient's pocket a day or two. It straightens nicely and is no trouble to preserve in flat shape, though it will not enter a pigeon hole in a desk.

Such a catalogue costs no more than a batch of circulars and brings a customer into contact with your entire product, and enlarges his desires at once. If you send a party such a catalogue you will not give him or yourself the benefit of a doubt and send another. It seems too big to scatter broadcast. McB. had ten thousand excellent catalogues printed, costing about 8 cents each. I saw him mailing some 10x12 photos. of punching machinery to inquirer, and asked him why he did not send the catalogue instead, knowing that the same punches were therein illustrated in good style. He poohpooed the idea and said that the nice catalogue was too expensive to send to everybody.

He had the bill for $800 in his head together with the engraver's bill, and totally neglected the fact that each of those ugly big photographs cost as much as four catalogues, and would never lead a customer into new fields. Those big photographs, without any accompanying description or anything else to give them value, would have to be pasted on a door for preservation.

Catalogues to be the most useful should have fine cuts, and should answer all reasonable inquiry regarding details, etc., and should be of such small cost that they may be given a large circulation.

I now trust in Providence for an example, and refer to the *bijou* catalogue of Brown & Sharpe.

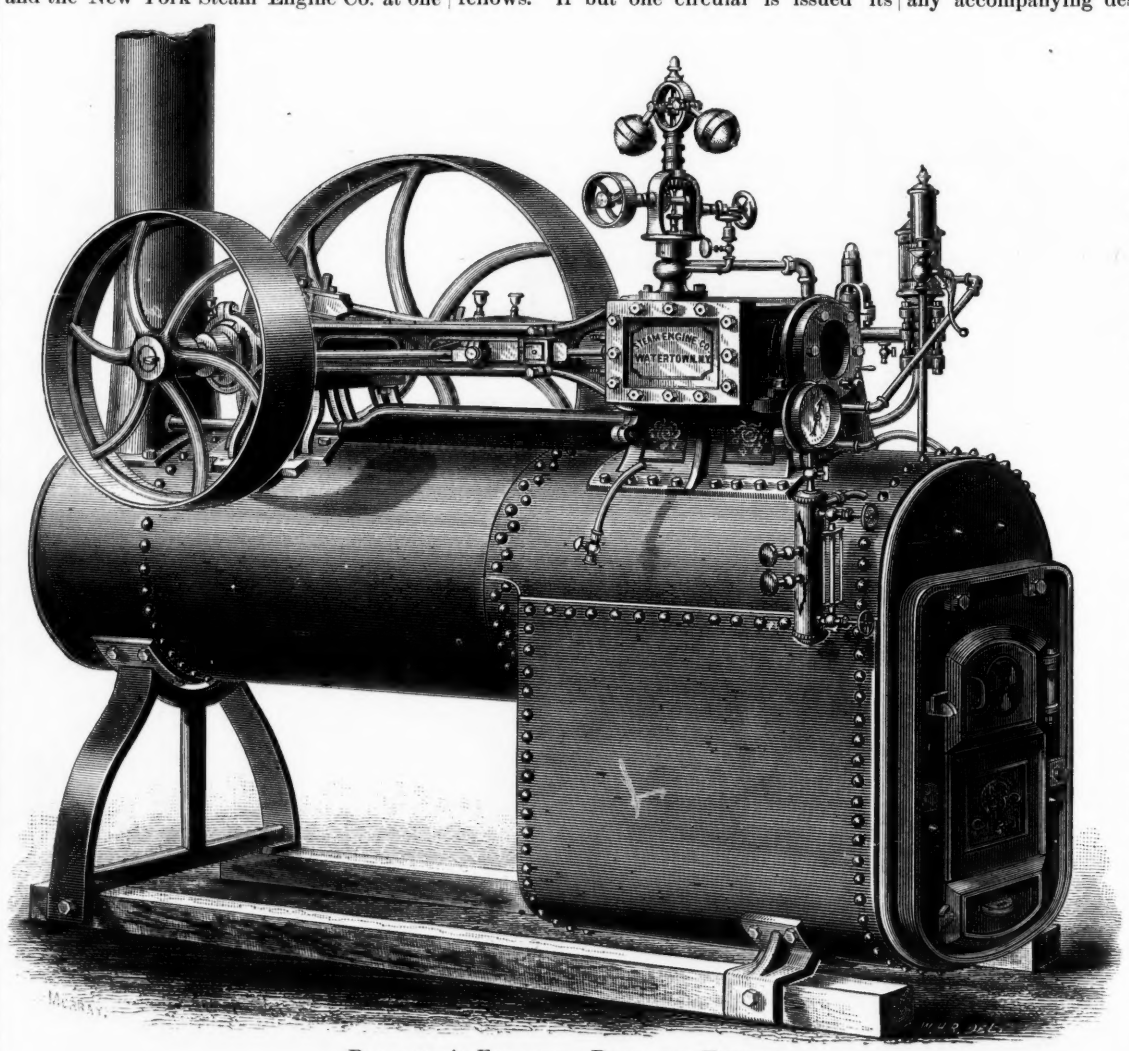
Here is a size which will enter a common envelope, a common pocket, a common pigeon hole, and will travel on a common stamp. Notwithstanding its small size the cuts are as perfect for the purpose as any catalogue cuts I ever saw. The entire standard product is catalogued, and the size of the book is such that it may be placed in the hands of *every* correspondent, thus becoming a real advertisement of things a customer may some day desire.

As new products are developed they are immediately added to the catalogues on hand by means of insets, and new copies are unhesitatingly mailed to all. A new edition of course includes the inset matter. The catalogue matter has an important bearing on the machine business, and I hardly think you will consider the time wasted, which results in more attention being given to the subject.

* * * * While on the subject of catalogues, &c., I might as well keep on and suggest that a good illustration of a machine will always have some gauge for proportion. Those skilled in the art can often tell at once how big a thing is, but there are many novel machines which a cut will not intimate the size of.

Pope built a water works engine for a city of the first-class, horizontal, direct-acting, and of immense proportions. He had it photographed, and the photographs passed current as representing a hundred dollar steam pump. A man, or a chair, or a water pail, or a clock, would at once have given this picture full value. McB. builds little punches and big ones, and sends big photographs of big machines and little ones of small machines. A happy idea when we consider that he sends them out in lots of one.

* * * * At one time in my life I formed



Bradford's Excelsior Portable Engine.

the habit of sorting things out of the pile of scrap iron, laying aside such as I thought would work into some job some day. The "sorted" pile became the largest, and when some job would come along which seemed to call for some of my pet cullings I would tell Gus to wait a minute till I went out and got just the thing we wanted. Then commenced a search. Am sure its there. Saw it not over a year ago. Here Bill and Mike, tear open that scrap pile. Soon I find it. Told you so; it don't look as big as I thought, but I guess we can make it do. I figure on the thing, and finally take it to Gus with his orders. When the job is done it is a patched job, and weighs six pounds. Castings at five cents makes thirty cents as the value of the piece finished from the scrap pile. Let's see what it cost. Gus loafed an hour, and the men worked an hour on the pile, and Gus worked two extra hours trying to adapt the unlucky "find," and I staid by the job two hours extra. That makes a dollar and seventy cents as the cost of that chunk, for which I can only charge forty cents in the rough, for our shop is a jobbing shop, and the bill is made for the rough casting and for Gus' time only. Chunks of iron culled from the scrap pile generally require an amount of superintendence, which raises their cost to quadruple the cost of new castings from the foundry. Experience has converted me often, and now I refuse to abide on the premises while a "select" scrap exists.

* * * * If great care is not constantly exercised castings will accumulate around a shop. There are odd castings cast too often, castings acting as monuments of error, or of folly, and stock castings made from "old style" patterns and therefore useless. Inventory after inventory sees these castings weighed up at standard price when, in fact, they are only worth the market price of scrap. They will get the best of any shop if not systematically kept down to zero. Not weeded, mind you, but destroyed root and branch.

Quirk let hundreds of tons of such stuff accumulate, and his successor failed to find a pound of standard castings in the whole lot. It looks hard, and will cause pangs, but I unhesitatingly declare it to be the most economical plan to melt up every pound of casting not standard to-day If the design of a machine is changed to-day, melt up those castings which ceased to-day to be standard. Odd castings always block the entry port against economical and labor-saving system. If a customer wants a casting he will pay for pattern and casting, but if you succeed in finding something approximate he will pay you for the casting but never a cent for the valuable time consumed in hunting it up.

* * * * Is there a machinist living who cannot picture to himself the foreman hunting for a casting. The occupied shamble over the interfering pile, the peculiar expression of conscious memory, combined with a half-desparing look of puzzled dissapointment, and, above all, the inevitable loose-jointed dirty two foot rule. * * * *

Very respectfully,

CHORDAL.

Engine Construction.

BY PROF. JOHN E. SWEET.

"Chordal," in his letter on open and solid boxes, asks for the opinion of others on the subject.

I would like to say a word or two, or more especially, say something about the grindstone frame, but dare not unless he will agree to not "talk back," for I am sure whoever gets into a controversy with him had better have a nest of hornets around his head. * * *

I see that Mr. Hoffman, in your paper of the 12th, criticizes the banjo or girder engine frames and the unadjustable guides. Well, I like that. First: Because I do not believe the girder frame to be quite half right. Second: I do not think the side below the cross-head as good as the two on the sides; and, farther, the opening of this question gives me an opportunity to suggest that, if slides or guide bars wear concave, as I suppose they usually do, would it not be well to find out just how long the cross-head ought to be, and just how short the slides ought to be, so they won't?

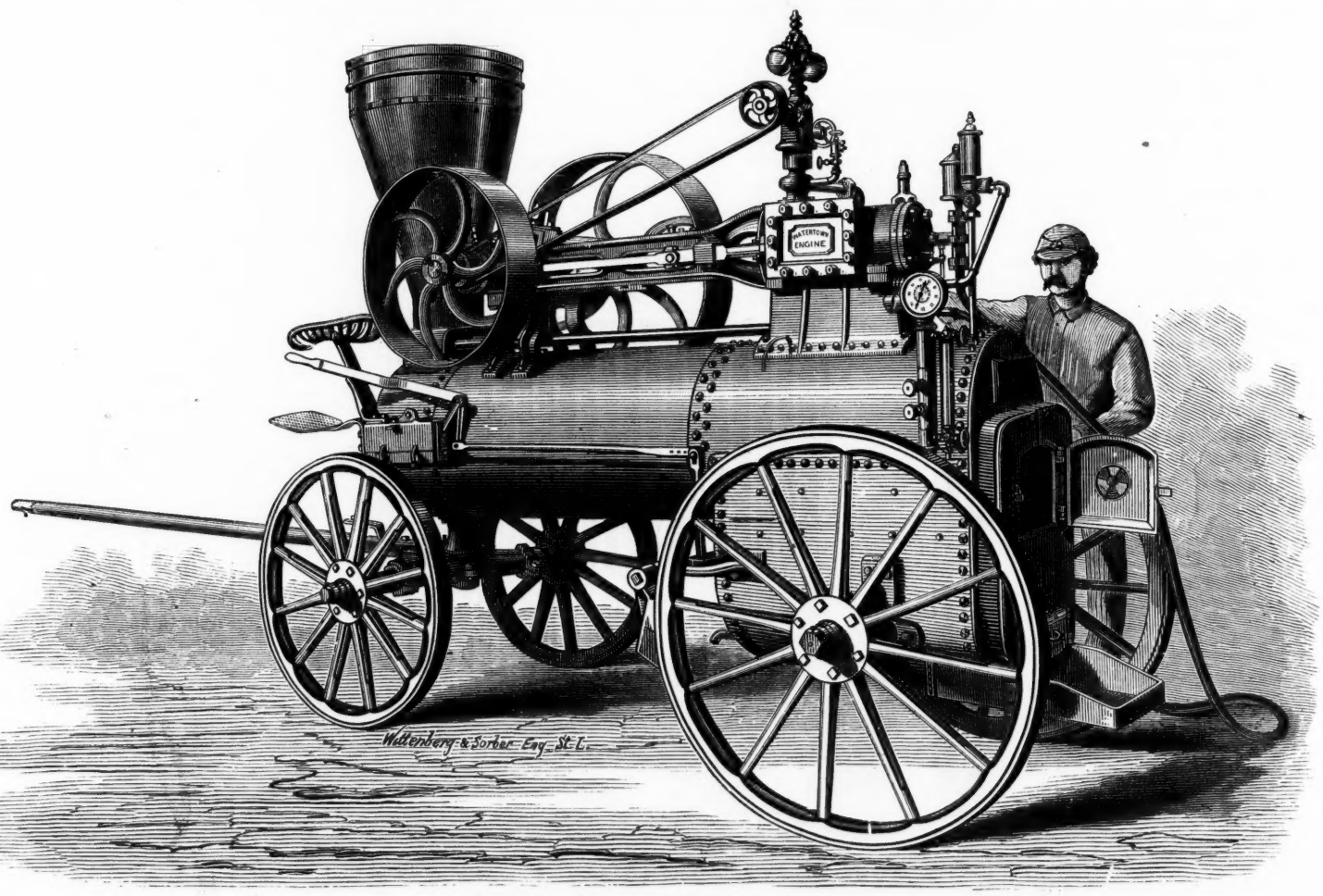
With cross-head and slides of equal length, 17 inch for an engine of 12-inch stroke, I have not discovered any such tendency; in fact, I think the tendency rather in the opposite direction. Probably nine out of ten who read this will at once say: "Well, if you had an engine of 12-foot stroke, would you have your cross-head 17 feet long? I would not, and perhaps I would not have the engine of 12-ft. stroke. But, if I was thoroughly convinced, as I am, that long cross-heads do better than short ones, I would have them as long as I well could.

In most horizontal engines, say up to 30-inch stroke, there is room for a cross-head equal to the length of the stroke, and, with this working on slides about once-and-a-half the stroke, there will not be much concaving. To come down to a still finer point, as the greatest pressure, and, of course, wear, is one side of the center, so, too, the cross-head ought to be out of the center, or pass over the most at one end. To so proportion the slide that it will keep straight and wear down uniformly is better than any amount of adjustable devices, because the one is always right and the other always more or less wrong, except when first adjusted.

As to the banjo frame, some builders have have had the good sense and honesty to copy the Corliss frame out and out, while others have tried to arrive at the same result by some counterfeit arrangement in which it seems they have tried to disguise the fact, and in doing so have overlooked the question of strains entirely. Take for example, a well-known western engine in which the frame is bent into a reverse curve. The strain tends to straighten out and double up these curves at every stroke; and to resist this tendency the frame is made of H section, it being one of the strongest forms to resist such strains; but, unfortunately in this case, the H is placed the wrong way. However, the builders, no doubt, think the frame abundantly strong, and if no evil consequences arise from the constant springing, as indicated by Mr. Hoffman, it is.

Again, in the same engine the pedestal under the cylinder is set so as to resist the inertia in the direction of the stroke, while it ought to be entirely resisted by the pedestal under the main-bearing. The pedestal under the cylinder should be free to move in the direction of the length of the frame to admit of expansion, while, at the same time, the pedestal should be perfectly rigid laterally to resist the tendency the cylinder has to swing sidewise. Mr. Corliss so far got his right the first time, and any builders adopting that style had better follow his example.

I am one, however, and not one alone I hope, who believes that the strains due to the action of the steam ought to be resisted by the engine frame independent of the foundation; so that the foundation will have nothing to do but support the weight and serve as weight to resist the vertical vibrations. It would be a little interesting to know what reputable builder has changed from the girder back to the box frame; and how he gets his money back for the iron put in the off-side.



IMPROVED AGRICULTURAL ENGINE.

Evaporation of Water in Steam Boilers.

BY WM. J. WILLIAMS.

It is not often that we are enabled, by actual trial, to ascertain what quantity of water we may be boiling off in the boiler or boilers under our charge in a given time. As engineers, in some cases, we experience the fact that we may be burning up a large amount of coal each day, which taxes our muscles, our ingenuity, and our skill as firemen, to keep up steam. We can with tolerable accuracy, even without a pair of scales, tell how much coal we may be using; but to tell how many pounds of water entered the boilers, while a certain amount of fuel was being consumed, we have no means of ascertaining. Boilers have been set, worked, and worn out, and no one ever knew how much water was evaporated by them in any given or un-given time.

If we have been fortunate enough, when boys, or in after manhood, to have studied up the three "R's," viz.: *Reading, 'riting, and 'rithmetic*, we can with the aid of certain rules, ascertain the number of pounds of water that each pound of coal *ought* to have evaporated from a given temperature, but then we have to suppose certain conditions to be fulfilled. The coal may be good, bad, or indifferent. We have no means except that which long use may have given us —a sort of intuition, as it were, of judging as to its quality. We have no means of knowing whether the coal contains the average amount of the heat-giving principle, or not. The boiler plates may or may not be of a quality to transmit the greatest amount of heat from the fire to the water inside. Again, the boilers, possibly, may not be set in an advantageous manner.

In fact, so many things about it control results, and leave us in doubt as to the accuracy of our calculations to suit the case in hand, that we are compelled to say it is *about* so and so. If the steam furnished is used for the sole purpose of propelling the engine, in ninety-nine cases out of a hundred we have no means of ascertaining how much is being actually used by it; and any figuring we may do is simply useless, because we have no means of getting at *data* to begin with.

In places where steam is used for other

purposes than that of running the engine, as in dyeing and other purposes where large quantities are used, the problem is still more difficult to solve. In such places the engineer has no control over the amount used in such manner. His engine may be kept up to its highest state of perfection with the means at his command; he may be ever so skillful a fireman, laying on the coal in the most approved manner, watching his chances to clean his fires, etc., but when there are a dozen or more workmen in the mill, and each of them open a 2-inch steam pipe at the same time, as Robert Burns would say—

"The best laid plans of mice and men
Gang aft agley."

A veritable battle begins between the engineer, the coal pile, the fires, the boilers, and the water in them, opposing with teeth and nails a set of men at the farthest end of the steam pipe, who neither know nor care how steam is made, or what it costs. The writer has been in such battles, and on one occasion remembers that he and his firemen fought nobly. for four hours, with nearly 300 computed horse power of steam boilers for 1 lb. of steam. The steam gauges at the beginning of the battle marked 40 lbs. and at the end of the struggle 41 lbs. This is about the worst experience I ever had in my line of business; it was a daily struggle of no mean dimensions. Below will be found 10 hours' consumption of coal and water used in three tubular boilers, the dimensions of which are: length, 15 feet; diameter, 5 feet; number of tubes in each, 60; size of tubes, 3½ inches; the boilers were surmounted by a steam drum, 15 feet long, and 2 feet in diameter.

The steam feed-pump received its water from a tank, and the quantity of water used was arrived at in the following manner: A nail was driven into the tank, at a point sufficiently higher than the end of the suction pipe, to assure no suction of air when starting the pump. The cubical contents of the tank from the *nail* to the *overflow* were noted, and water was allowed to flow in until the overflow was reached, when the supply was cut off. Then the pump was started, pumping out the given quantity when it would be stopped and the tank re-filled, and the number of tankfuls used daily noted. At the commencement of the trial each boiler contained three gauges of water, fires in a certain condition, and at the finishing they were left in like condition. A record of the steam gauges at certain intervals of time is also furnished.

RECORD OF STEAM GAUGES DURING THE TEST.

At 7.00	A. M.	70 lbs	At 12.00	M.	45 lbs.	At 4.00	P.M.	9 lb.
" 7.55	"	60 "	" 12.30	P.M.	30 "	" 4.30	"	64 "
" 8.00	"	52 "	" 1.00	"	35 "	" 5.00	"	65 "
" 8.48	"	62 "	" 1.30	"	46 "			
" 9.48	"	65 "	" 2.00	"	39 "			
" 10.40	"	60 "	" 2.30	"	50 "			
" 11.00	"	45 "	" 3.00	"	60 "			
" 11.30	"	50 "	" 3.30	"	70 "			

Square feet of heating surface.	Number of square feet of grate surface.	Mean temperature of feed water.	Average steam pressure.	Pounds of coal consumed in ten hours.	Cubic feet of water evaporated in ten hours.	Pounds of water evaporated for one pound of coal.
3,535	82½	160°	5,405	11,275	1,303,985 or 81,499 lbs.	7,228

When it is added that these boilers were connected with five cylinder boilers, 36 feet long and 30 inches in diameter, also fired in such a manner that no more fuel could be burned under them, some slight idea may be formed of the whole quantity of water necessary to supply a part of the establishment with steam. No attempt was ever made to ascertain how much water was required for the cylinder boilers; but it was generally thought that they did more in proportion than the tubulars, whose draught was at all times bad, while the cylinder boilers had a most excellent one. Not only during the trial were the dampers open all the way but practically they were of no use at any time, as I think the record of the steam gauges will demonstrate.

The ten hours' work recorded is a fair sample of each day's requirement of them, and as there was a difference of opinion as to whether the chimney of the tubulars was of sufficient proportions for the work required of it, and general disappointment as to the quantity of steam furnished, I would like some of the readers of the Machinist to give their views of what sized chimney internally, and what height, would be required for such a battery of tubular boilers as I have described.

I know there are given rules, but, unfortunately, they don't seem to have the confidence of those having large experience in making steam. There is room for doubt, so far as my experience goes, that in many cases this important adjunct of the steam boiler is not as well studied as it should be. Looking back at chimneys built by direction of certain constructing engineers, I find that they hardly ever build two, in succession, of the same form internally. While one is like an inverted funnel, the next will be the opposite, a third will have no taper, being simply straight from bottom to top. I can call to mind two chimneys at one establishment, that while one was 3 feet square at the bottom, and 7 feet square at the top, the other was 5 feet square at the bottom and 26×27 inches at the top. Verily, the ways of man are wonderful sometimes!

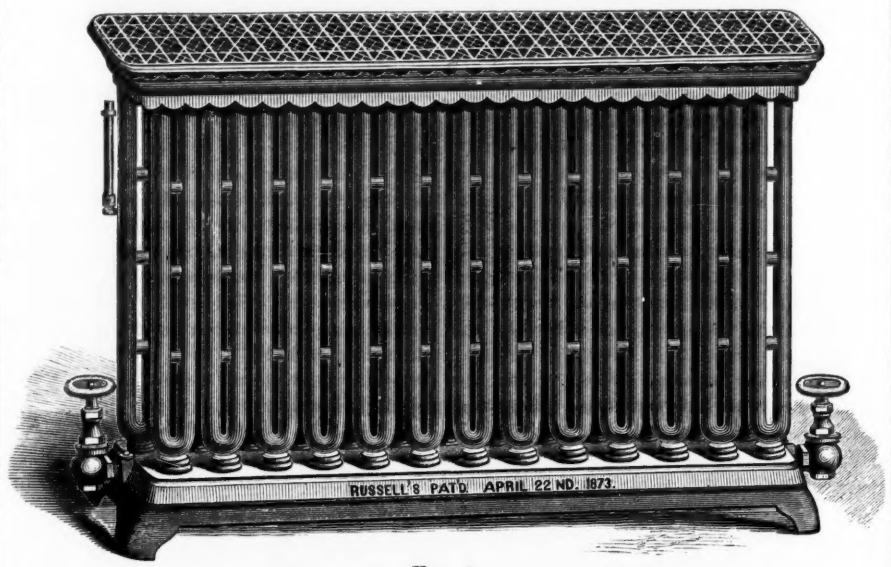


Fig. 1.

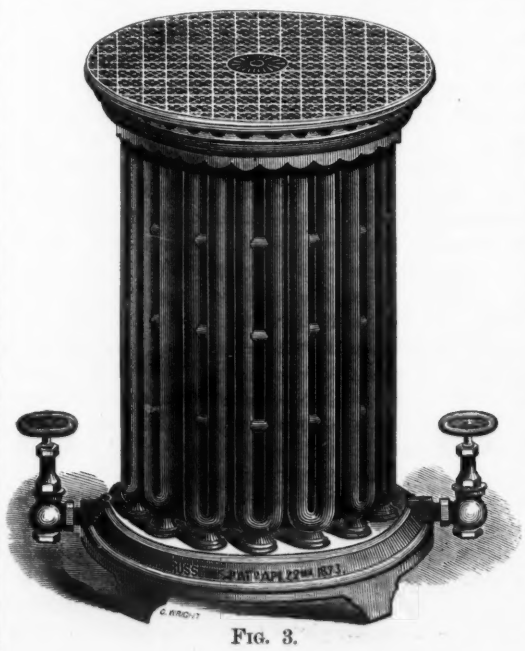


Fig. 3.

Improved Steam Radiator.

The Steam Radiator described in Figures 1, 2 and 3 is known as Russell's Patent, and is manufactured by McMann & Russell, 56 & 58 Gold St., New York.

Figure 1 represents an elevation of the radiator as set up ready for use. The base is constructed as shown, and into it are screwed cast-iron tubes made in pairs, with cross passages connecting them at short intervals.

Fig. 2.

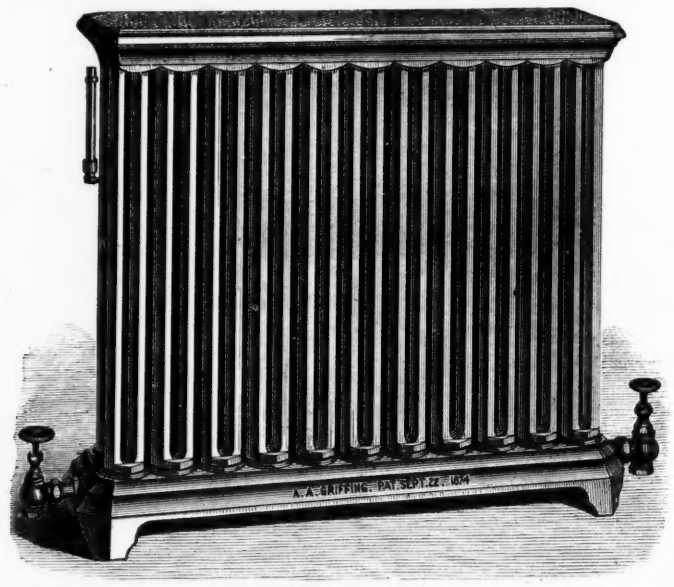


Fig. 4.

Figure 2 shows a section of the tubes. These cross passages permit the steam to circulate through them as well as through the vertical tubes, thereby completely expelling the air; the steam, by traveling in short circuits, it is claimed, heats up the radiator much quicker than by any other device known. These passages or sections afford just so much increase of heating surface. When steam is admitted to the base of the radiator, it rushes upwards into the tubes and passes rapidly around and through the cross communications successively, causing a most active circulation, expelling all air immediately.

Each section or pair of tubes is connected to the base by a single taper screw joint, that will remain perfectly tight, and cannot be affected by expansion and contraction.

It combines the essential features of strength, symmetry and beauty of design, and is said to occupy less space with a greater amount of effective heating surface than any other radiator. The surfaces are plain and easily kept free from dust.

Each section or upright double pipe, with its cross connections and its proportion of the base, affords 2½ square feet of effective heating surface.

All the parts are made in duplicate. Should any part give out from any cause, it can be replaced with little trouble or expense.

This radiator is equally adapted for high or low pressure steam, and is made in a variety of convenient sizes

The positive circulation of steam and the complete drainage of the water of condensation are secured by the vertical position of the tubes The usual height of this radiator is thirty-six inches, but these dimensions can be changed if necessary.

The radiator shown in Fig. 4 is made by the same parties as the above, and is known as Bundy's Patent.

By arrangement between the respective patentees, the sale of the Bundy Radiator is restricted to the States of New York, New Jersey, Delaware, Pennsylvania, District of Columbia, West Virginia, and the counties of Litchfield and Fairfield in the State of Connecticut.

The principle involved in the two styles being very similar, both using the cast iron vertical loop, this agreement has been resorted to, in order to save the interminable expense and trouble that would necessarily result from the adoption of the opposite plan. So long as the public are well served with a good article at a moderate price, this would seem like a very sensible arrangement all round, as there is never any real benefit to the general public in a Kilkenny cat fight among manufacturers when prices get below a certain fair level.

The special advantages claimed for the Bundy radiator are as stated below:

1. Each tube is screwed independently to the base by a single joint; actual experience proves that leaks never occur except through some defects in the casting.

2. The joints are not affected by expansion or contraction, and if once made tight will remain so.

3. Perfect drainage of the water is secured by the vertical position of the tubes. Consequently they never become inoperative from the accumulation of the water in the pipes, and are not liable to injury from rust or freezing.

4. They can be made to fit almost any place and occupy fifteen per cent. less space than any other radiator.

5. Are very easily kept clean, as there are no corrugated surfaces to catch or retain the dust.

6. Each column contains full three square feet of surface, with its proportion of base.

In addition to a suitable number of sizes of the above patterns, the manufacturers also make an indirect radiator with the Bundy pipe, two, three or four pipes wide, and as many long as may be required. These radiators are superior to the box coil, cost less and take up much less space.

Advantages of High Speed Engines.

BY CHARLES T. PORTER.

The coming steam engine, for stationary uses, is to be a horizontal high speed engine. If anything in the future of engineering can be regarded as certain, this is that thing.

For all purposes to which steam power is applied, rapid rotation of the prime mover possesses such real and important advantages, that its general employment is a logical necessity. These advantages may be briefly catalogued as follows: Reduced cost, especially for the greater powers. Small size of engine, and of fly-wheel. A compact and self-contained form, presenting a degree of rigidity, both in the stationary and the moving parts, that is unattainable in engines of long stroke. Steadiness of motion; the rotation of a single cylinder engine being, even with a small and light fly-wheel, more nearly uniform than that of coupled engines, at what have, until recently, been their ordinary speeds.

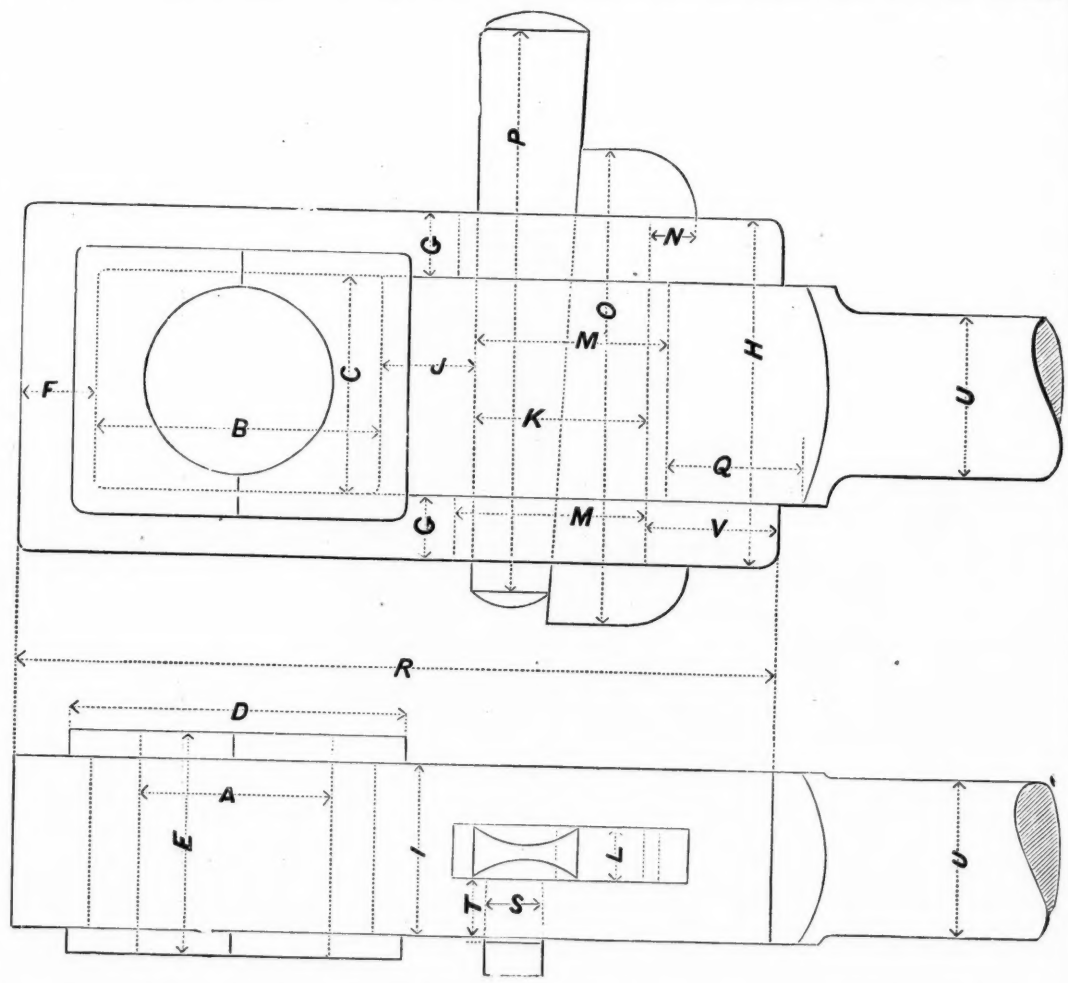
The ability to employ short and nearly or quite parallel belts, in place of long and converging ones, and to give to them rapid velocities from comparatively small drums.

The avoidance in a great degree of intermediate gearing for the purpose of getting up the speed required in lines of shafting, and in machinery. The saving in room, buildings and foundations. The increased economy of fuel directly creditable to the more rapid speed of the piston, or the reduced internal surfaces of the cylinder.

Each one of these points might be made the subject of an essay. Some of them have been the theme of many a one. They are of the most substantial and practical character. Has the steam engine, in its progress, reached a stage at which they can be realized?

A New Departure in Building Steam Engines.

The many authors who are exerting themselves constantly to produce "just the thing" that is wanted in the engineering community, necessarily bring out many good things, although, as a whole, their work may not be entirely satisfactory, either to themselves or others. Among the many good things that have been brought to our notice, is a descriptive sheet 11×17 inches which is for convenience placed within covers, size 5×7½ inches. It contains the first of a series of engineering details, which the author, Wm. M. Barr (who is a practical mechanic), intends to publish on separate sheets, in which a figure, similar to the annexed illustration, which represents a strap joint, in which the proportions are calculated and given in plain figures, ready for immediate use in the drawing-room, pattern, blacksmith, or machine-shop. In connection with this drawing are tables which contain the proportions for twenty-nine strap joints, ranging from a pin one inch in diameter to six inches. This sheet contains in all *six hundred and thirty-eight* separate dimensions, which accord with the best engineering practice of the day. The dimensions indicated by letters (shown in the illustration) are given in plain figures opposite those letters in the table. The author claims among the advantages of having the minor proportions of machines and engines fixed and tabulated in some such manner as this, for ready reference are, viz.:



1st. A saving of at least two thirds of the draughtsman's time in shops where drawings are used.

2d. It forms an invaluable table of reference for the use of inventors, foremen, master mechanics, and proprietors of small shops, by means of which proportions may be ascertained at once, and the work made directly from the table, without any other aid or drawings.

3d. It insures a more perfect uniformity of design and proportion than is possible by any other means.

The intention of the author of this work is to print these tables as far as practicable, on sheets of a uniform size, 11×17 inches. These will be folded and secured in a convenient cover, about 5 inches wide by 7½ inches in length, with title on the outside. It is also the intention of the publisher to issue from time to time, similar tables, which will include every detail of high-pressure steam engines, varying in size from 5″×10″ to 30″×60″.

These works are published at a very low price, within the reach of every mechanic, and are furnished by Wm. M. Barr, Indianapolis, Ind.

Shafting out of Line.

Shafting is always liable to get out of line, therefore, it is well to line up as often as twice a year, to be sure that all is right. It has been in times past a common thing to allow shafting to run as long as it would go without adjusting, and then stop the works for a day or two to line up, which is unnecessary, and only a loss of time. A shaft may be leveled by almost any one when the hangers are properly made, and can be done at noon, or after stopping in the evening, without interfering with the business at all. But enough time should be allowed to insure a good job. To line a shaft horizontally is but little more trouble, if the bearings or hangers can be moved in that direction. Suspended hangers should have the bolt-holes slotted for an inch or more of movement, and post-hangers should have movable bearings and permit side adjustment. Assuming that there is some means of moving the shaft horizontally, a good plan of adjusting it is by suspending a number of plumb-lines that will bear against one side of the shaft, and reach down low enough to be sighted from the floor.

Gleanings from the Foreign Press.

Concerning the attitude of English workingmen toward their employers, *Tinsley's Magazine* has the following sharp and timely criticism: "The British workman on strike, while his master is only trying to keep his factory open for their benefit in the hope of better times, is a picture of folly, not to say ingratitude, which one can only contemplate with wonder and amazement. The English mechanic in his insular pride and strength cannot realize to-day, any more than he has in the past, that he has a compeer in his own line under the sun. His contempt of foreigners is proverbial, and it was at one time excusable through the English workman's triumphs over every other working people. All trades have legends of the ease with which he has beaten the foreigner whenever they have come into competition. The English workman has been all over the continent making railways, putting up machinery, and building ships. Wherever you travel you find traces of his skill and genius, his industry and his power. But the world does not stand still. It learns, it applies its knowledge. It is no longer dependent on England. It can make machines and work them without the aid of the English. Times have changed. When I was a boy English machines and mechanics were continually being sent for by foreign governments and companies to erect machines and preside over foreign works. Foreigners come to England now on similar missions. But the British mechanic does not learn: and when the supreme hour of trial comes, as it has come once more, he is helped by public subscriptions to weather the storm at home, or he is assisted to carry his experience and his labor to other lands. When the capitalist imitates him and does likewise, England will become a residential country, and London the pawn-shop of the world. Our manufacturing districts will decay like those out-of-the-way old towns that lived on the coaches of former days, and the commercial supremacy of England will be 'as dead as a doornail,' a thing to write about and look back upon with wonder and regret."

A MARINE BOILER EXPLOSION.

A fatal boiler explosion, says the *Engineer* of July 4th, occurred on board the steamship Black Swan on Sunday last off Yarmouth, by which a fireman, the second engineer, and his brother—who was taking a pleasure trip in the vessel—were killed. The chief engineer happened to be the father of these two unfortunate young men, and, hearing the report of the explosion, rushed to the engine-room door, where he was met by the escaping steam and scalded to such an extent that he now lies in Great Yarmouth Hospital in a very precarious state. On Monday last an inquest was formally opened on the bodies of the sufferers, before Mr. W. Holt, the borough coroner. The bodies were identified, the captain's evidence taken, and the inquest was adjourned, pending the arrival and reports of the Board of Trade officials, who had been instructed to inquire into the cause of the accident. On Tuesday and Wednesday last, Mr. Samson, one of the Consultative Staff of the Board of Trade, examined the boiler, and on Thursday he gave evidence as to the cause of this accident, which was to the effect that it had occurred in consequence of the boiler being too weak to stand the working pressure to which the valves were loaded, and that this weakness was mainly attributable to the manner in which some so-called repairs had been executed. It appears that this boiler was an ordinary cylindrical boiler made by Messrs. Thomson and Boyd, to work at a pressure of 60 lbs. per square inch, in the year 1870. It has three furnaces, each furnace leading to its own separate combustion chamber. The explosion took place in the combustion chamber of the port furnace, the back plates of which had been forced away from the stays that supported it and the end plate of the boiler, and had bulged and torn completely across the chamber. It appeared from Mr. Samson's evidence, that the ends of the lower stays in the chamber had been covered with plates to prevent them from leaking, the leakage being originally caused by the plates buckling between the stays—owing to their having worn to about one-half their original thickness—and this is what is meant by so-called "repairs." Had the weakness of these plate surfaces been appreciated or known by the owners, superintendent, or boiler-maker, instead of being covered over, they would have been fitted with new stays, with nuts flanged within, or else stays inserted between each. It appears quite clear that this disastrous explosion did not occur in consequence of valves sticking, shortness of water, or extra pressure, but merely because the boiler was in local places worn out, and, instead of these places being intelligently repaired, they were merely patched over. It should not be thought that this was done to save expense, but from ignorance. Three men have lost their lives, which, by a little forethought, might have been saved.

Editor American Machinist:

Your paper recently contained an article on the indicator diagram, by a Philadelphia correspondent, which was false in its statements and insulting in its tenor. It was followed by an able and readable defense over the signature of "Mons. Yennepe" who erred only in the fact that he thought it necessary to reply at all. The absence of a veritable signature now becomes a pretext for a personal assault, which we trust "Mons. Yennepe" will not dignify the second time by notice.

It is proper, however, from my personal connection with the Exhibition at the Mechanics' Fair, that I should make a statement—begging pardon of "Mons. Yennepe" if I intrude—and I will endeavor to make that statement and its accompanying signature sufficiently explicit not to be misunderstood a second time.

Now, therefore, neither exhibitor in question, at any time, during said Fair, either in person, or by deputy, charged the other, either directly or by implication, however remote, with tampering in any degree, however slight, with any diagram, taken by themselves or any other person, either before or during said Fair, from the engines there on exhibition, or from any other engines ever made by the exhibitors aforesaid. Second; both of said exhibitors are in the full knowledge and belief that not only were all the diagrams there taken or exhibited unquestionably genuine in every particular, truly representing the actual performance of the engines in question, but that said diagrams can not only be duplicated but exceeded in perfection by many others of their respective engines already built and hereafter to be built. I trust I have covered the points.

Mr. Roper has assumed to insult business men of established integrity and widespread reputation, which, considering the source, was of too little importance to call for a reply, were it not that he seeks to press the statements the second time in an offensive manner. The relations of both "Mons. Yennepe" and myself to the two exhibitors in question enable us to speak with authority and without fear of contradiction, which fact forms our apology for alluding to the matter in your columns.

WM. LEE CHURCH,
17 Cortland Street,
New York.

Two hundred and sixty-five applications for space for 50,000 feet have been made to to the Space Committee of the Cincinnati Exposition.

Systems of Time Keeping.

COHOES, N. Y., July 28th, 1879.

Mr. Editor:—

"Chordal" very sensibly says, there is a vast amount of valuable experience among the readers of the AMERICAN MACHINIST, and I think there is a vast amount among its writers. I have read scientific and trade journals for about eight years, and I must say that I have never obtained so much satisfactory and sound logical information from any as I have from the articles in the AMERICAN MACHINIST; and have read from but few other writers who know so much what they are talking about and are willing to learn more. I think such men should have all the encouragement and support possible to go on with the good work of diffusing knowledge, in the simple and understandable way in which they do it. We should all contribute our mole hill for them to use in making mountains.

"Chordal" says, he is anxious to hear something, or all, about systems for keeping time and paying off. I know of several such systems which, with your permission, I will give to your readers.

I will begin with one which gives only a bill for the time put in each day. It consists simply of having a slip about 4 x 6, put up in blocks and ruled and printed as shown.

TIME SLIP OF B. & H. M. Y. G. Co.

Date.....187

	Hrs.	Min.
SIG. J. WILLIAMS.	8	30

This is correct, *Foreman.*

One of these blocks is given to each man, and when he quits he simply writes day and date and the number of hours put in and signs his name. This slip constitutes a receipted bill for the number of hours shown on its face. A file is provided and placed on the foreman's desk, and when the men go out they place their slip on file. At any convenient time the next day, the foreman looks them over, and if he is a man who has the interest of the concern at heart, he knows whether they put down more time than is due them; if so, he has it corrected at once, and there is no trouble in store for the future. After this, they are turned over to the book-keeper. Then at the end of the week or month the man's time can be made up, his money put into an envelope and handed to him while he is at work, and no time is lost, neither does any one have to stay late. This is about the simplest way of keeping labor and wages account. It is easy enough for a man to put in a bill at the end of the week or month, and it is easy enough for the bill to be paid and charged to labor account, but we want something to show that this man has really put in the time charged for in the bill, and this slip will supply the place of the foreman's memory.

Respectfully yours,

GEO. GUNTZ.

NEWARK, N. J., July 21st., 1879.

Editor American Machinist:

DEAR SIR: In extract from "Chordal's" letters, as per your last issue, I find that he refers to matters connected with pay accounts and labor about shops.

His ideas seem to be thoroughly mixed with old fogy systems, and the fear that a receipt for money, though properly drawn and signed by the party receiving, is not legal when engrafted in a time book.

Any conscientious jury will pass a properly signed and constructed receipt.

His "commonest plan" is one of the outcroppings of the flush times, and not in vogue in any well-managed shop, as the labor connected with it was performed by sinecures, who were promptly weeded out during the approach of the panic and hard times. It was no great loss to any company, however, and I think it will not revive in its ancient form. The experience of the past five years has condemned it.

Asking a man to sign a "thing," without giving him time to figure it, is not an improper request when made by any honorable employer. Should the "thing" signed not be correct it could easily be explained and corrected afterward.

Employees are not worried if a slight error occurs once and awhile, provided such errors are promptly rectified. Where a large body of employees are to be paid, it is better to have a system in practice, whereby all mistakes are corrected before labor sheet is presented for payment.

Other methods mentioned by "Chordal," are probably in use at the desire of the management of the concern. The bill system would answer, after a fashion, where none but intelligent people are employed, and where the clerk is not to be depended upon for correct report of time, as it might be taken as a check upon his time book. When applied to large institutions where all kinds of labor is employed, it would be a farce, as probably one-fourth of the employees would be unable to fill out blanks, and as a consequence would deputize some agent to do the business for them. Delay by reason of erroneous demands would ensue. Corrections would take considerable time when most valuable, and when receipts are all collected and filed they are not as easy of access as a sheet containing names, &c. in a proper order. By the bill system the employee takes the receipt (blank) and money with him and returns receipt signed on following day. There is nothing in this to commend it to any business man.

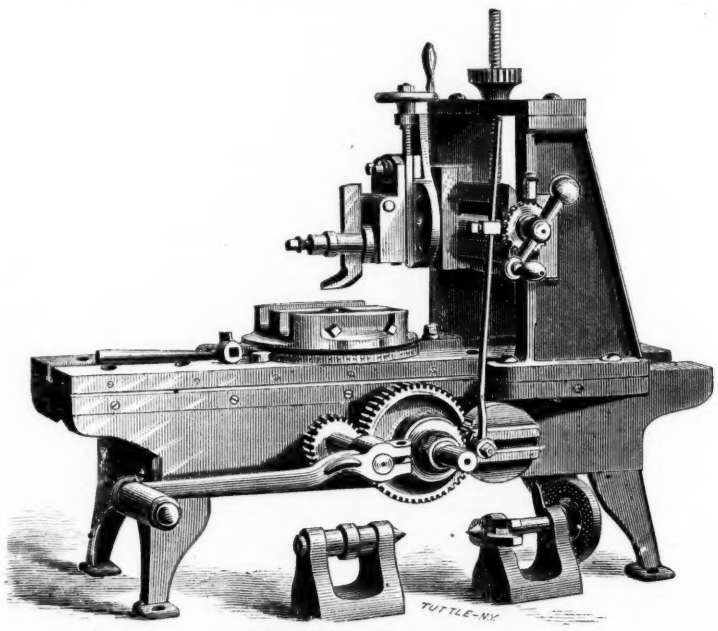
I hope that I have not intruded too much, and before closing desire to give "Chordal" great credit for his straightforward way in starting the argument. If some other of your readers do not advance a system such as "Chordal" desires, I shall be compelled to do so myself, as mine has been in service for over ten years, and no complaints have ever arisen concerning it.

Yours truly,

SILEX.

New Hand Planer.

We present herewith an illustration of a 24 inch hand planer, manufactured by the Hendey Machine Co., Wolcottville, Conn., whose reputation for good work is widely acknowledged. It is for the use of parties who have no steam power. It planes 24 in. long, 8 in. wide, and 6 in. high. The table is run by a rack and pinion, both of which are cut to insure a steady motion of the table when working. The table is gibbed into the bed so that it cannot lift when the cut is being taken. The cross-head is fitted to the uprights in such a manner as to keep in a parallel position when it is raised or lowered. The head is graduated to set to any angle. The screws, nuts and wrenches are case-hardened. The cross-feed is automatic. The machine is fitted for slow or fast speed, and has a circular, graduator vise, and a pair of index centers. It weighs about 225 lbs.



NEW HAND PLANER.

John B. Gough, in a lecture in England, referring to the question whether alcohol was a food or a medicine, remarked that in his opinion it was "very much like sitting down on a hornet's nest—stimulating but not nourishing."

Forged Twisted Drills.

The process of manufacturing twisted drills by the forging process has lately been brought to a remarkable state of perfection. The manufacturers have, after many months of experiment, and by devising special machinery, succeeded in producing a drill with a smooth unfinished groove its entire length, preserving intact the outside, or forged skin of the steel which forms the cutting edge. It also adds greatly to the strength of the drill, acting as a support to the twist on the back as well as on the cutting edge, thereby lessening the tendency to untwist.

They are of a uniform thickness of center the entire length of the twist. The increased stiffness given to the drill by this process enables the manufacturers to save a large amount of material, which, by the old process, is milled out and thrown away; another point is dispensing with the increasing quantity of metal as the twist goes towards the shank, consequently the last inch of the drill will cut as easily as the point when new, which is not the case with some other drills. Fig. 1 represents a section of a forged twisted drill 2 inches from the shank, while Fig. 2 represents a cut, or milled drill, the same size as Fig. 1, and same distance from shank. By observing the cuts at the points *a* and *b*, the reader will observe a remarkable difference in the thickness, which is no exaggeration.

These drills are uniformly forged, and "backed off," or "freed" by "machinery," not by hand, which insures uniformity in this important particular, it being impossible to accomplish this perfectly by hand.

It is claimed that neither lip can split off from a properly ground drill, made in the manner described. They are also represented to do from two to ten times the work of any cut or milled drill, and to avoid the loss of time occasioned by grinding.

The manufacturers claim the following points as being entirely new:

1. The saving of material.

2. A uniform thickness of center throughout the length of the groove.

Fig. 1.

Fig. 2.

3. Greater strength with less material, and as the forged skin forms the cutting edge it ensures greater durability.

4. The "backing off" which is done in a machine which allows the drill to run free without being jammed in the hole.

5. The peculiar shape of the groove whereby the cutting edge is carried farther beyond the center of the drill, causing the same to cut without tearing.

These drills seem to meet the wants of manufacturers, and have already been adopted by several large shops in New York and vicinity, and are meeting with excellent success.

These drills are manufactured by the New York Twisted Drill Co., 240 Plymouth St., Brooklyn, N. Y.

The Civil Engineer.

BY STEPHEN ROPER.

The monuments, in ancient and modern times, which display the realization of the civil engineer's genius are almost as indestructible as the firmanent or the ocean; but at the same time, it must be remembered that unless the civil engineer is a man of talent and ability, to use a slang phrase, there is not much show for him. As he is frequently called upon to design, plan, and conduct enterprises which involve the expenditure of millions of dollars, as may be expected, prudent capitalists or great corporations, who wish to engage in some stupendous enterprise, are not willing to trust the expenditure of such an amount to any one, unless he is known to be a man of marked ability. Now, this being the case, it might be inferred that no man will attempt to qualify himself for the calling of a civil engineer unless he, himself, or his friends, are satisfied that he possesses talent and ability peculiarly adapted to that line of business; but such is not the fact. Like the "shyster" in the legal profession, and the "quack" in medicine, there are thousands of frauds, calling themselves civil engineers, who, in consequence of making a mistake in the choice of a calling, are a reproach to the profession, but who might succeed well in some other pursuit, or become average mechanics.

But it is of the average individual, who attaches a C. E. to his name, that we intend to make the subject of our remarks in this article. He is generally, taking his own statement for it, a man of immense caliber, or, in other words, very large bore, indulging in tall stove-pipes, and large fob-chains. To take his own statement for it, he is ready for any enterprise, however hazardous or desperate, to bridge the Atlantic, bore a hole clear through the earth's crust, or swing round the moon for the purpose of bringing down a shower on the sprouting buckwheat, or the young turnips; but he is very seldom engaged, and, like "Micawber," he is generally laying on his oars, "waiting for something to turn up." If it had not been for a slight accident he might have been in a good position, "it was just his luck," but he has an idea that some great enterprise would shortly develop, and that he is the "coming man."

The average C. E, like the fraud in every other profession, is generally endowed with an immense amount of cheek, and, instead of adopting the advice of Timothy Titcomb, setting himself down as a born fool when he first starts out in life, he takes quite the reverse course, inasmuch as, as soon as he makes a failure in his own profession, he sets the members of all other professions down as fools, and acts as though he considers it his special duty to enlighten them. It is very seldom, if ever, that mechanical engineers, however talented or gifted they may be, undertake to write up instructions for civil engineers; nevertheless the scientific literature of the day is flooded with treatises written by C. E.'s, for the instruction of mechanical engineers. They seem to forget, that though a man may be able to talk glibly on excavations, tunnels, and embankments, he may, at the same time, be totally ignorant of the duties of a stationary, marine, or locomotive engineer, or how to stop or start a steam engine.

A bookseller advertises a book entitled "An Engineer's Pocket-Book," intending it, of course, to be a hand-book for all classes of engineers, and it may contain a good deal of useful information, but it will be found, nevertheless, too limited to meet the requirements of any one class, as it would be impossible to embody such information in a book of ordinary size, or in any book that would come within the reach of persons of limited means; nor would it be possible for any author, however learned he may be, to

elaborate so great a variety of subjects, requiring, as they would, scientific accuracy and mathematical precision. With the same propriety the lawyer might write a treatise for the instruction of the doctor, and *vice versa*, or the doctor might attach the word "Squire" to his name, and the lawyer appropriate the title of 'M. D." Such presumption can only be palliated on the ground that they do not fully understand their obligations to the members of other professions, and that their talents or ability are not appreciated by those of their own. What they write cannot possibly be the result of their own experience, but must be confined simply to "vamping up" other men's ideas.

Blast Furnace Statistics.

The last regular quarterly report showing the condition of the blast furnaces of the United States, published by *The Iron Age*, gives evidence of a steady progress in the iron industry. In the summary, which we give below, only furnaces are included upon which reports were obtained. There are about 100 more in the country, some of which, now out of blast, will probably be abandoned.

A recapitulation of our table makes the following showing as to the number of furnaces in and out of blast July 1:

	In blast July 1, '79.	Out of blast July 1, '79.
Charcoal	81	176
Anthracite	101	125
Bituminous	95	107
Total	287	408

Since the 1st of July we have knowledge of the blowing in of a number of furnaces, and also that some are out of blast that were then blowing. The number of furnaces in blast to-day is greater than that given above.

Making a comparison between the condition of the furnaces on the 1st of July for each of three years 1877, 1878, 1879, we have the following:

FURNACES IN BLAST JULY 1.

	1877.	1878.	1879.
Charcoal	87	64	81
Anthracite	87	95	101
Bituminous	85	89	95
Total	259	248	287

FURNACES OUT OF BLAST JULY 1.

	1877.	1878.	1879.
Charcoal	181	202	176
Anthracite	139	130	125
Bituminous	123	128	107
Total	443	400	408

Comparing these data by percentages, which is the better way, by reason of the changes in the number of furnaces arising from various causes, we have the following tables:

PERCENTAGE OF FURNACES IN AND OUT OF BLAST JULY 1, 1877, 1878, 1879.

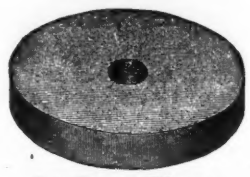
	In blast			Out of blast		
	1877.	1878.	1879.	1877.	1878.	1879.
Charcoal	32	24	34	68	76	66
Anthracite	38	42	44	62	58	56
Bituminous	41	40	47	59	60	53

The man in charge of the big engine at the water-works realizes that he has a curiosity for most visitors, and when callers express surprise and interest he feels pleased. The other day a stranger came in for a look around, and his general make-up satisfied the engineer that he was a person of deep thought and a man to appreciate the merits of monster machinery. The stranger viewed the engine from every side and angle, and sat down. Then he reviewed it and took another rest. Then he walked around the building in a wise way and came back for another inspection. For two hours he hardly had his eyes off the ponderous machinery, but was at last ready to go. Taking one last look, he walked up to the engineer and said: "Say, mister, this injine runs by steam, don't it?" "Why, of course," was the amazed answer, "Well, I thought so more'n half an hour ago," continued the man, "but it's just as well to be sure about these things. There are so many wind-mills around now-a-days that one can't be certain of nothing." —*Detroit Free Press.*

Oil Stones and their Uses.

BY L. F. LYNE, M. E.

About thirty years ago the manufacture of oil stones was unknown, consequently was not numbered among the industries of this or any other country. About twenty-five years ago, when the curative powers of the famous Hot Springs of Arkansas became all



OIL STONE WHEEL.

the rage, that place was the resort of people engaged in all branches of industry. In the course of their investigations, some of the visitors discovered the Arkansas quarries and also the wonderful qualities of the stone, its extreme hardness making it almost indestructible. Samples of this stone were distributed all over the country, and very soon its value became apparent, as no stone known at that time could compare with it for sharpening instruments of all kinds. Previous to the year 1851, this stone was used in the rough, as no way had as yet been discovered by which

ROUND EDGE SLIP.

to work it into a shape to become an article of commerce, and applied to the various uses to which oil stones are adapted. About this time the manufacture of oil stones was begun in earnest, and now America is the only place that produces the Arkansas stone, and has a trade established in all parts of the civilized world. The best stone is brought from Hot Springs County, Arkansas. The Washita, which is a softer and cheaper stone, is found in the same place.

ARKANSAS FILE SLIP.

The Turkey stone of which there is a great deal used, is imported from Smyrna, Turkey.

Great care is necessary in selecting a good quality of Arkansas stone. The best is a milk white, very fine and even grain, and so hard that a file may be broken in two and the end rubbed over the stone without making any impression. It is this peculiar hardness and fineness that make it so valuable where accurate and delicate work is required, as it

PEN-KNIFE PIECE.

will polish and finish the hardest steel or chilled surfaces. There are hard and soft grades of this stone, all of which are valuable for special purposes. One particular point to be observed in selecting material for oil stones is to get it free from quartz, for even the best stone will sometimes have a very fine vein of quartz or glass, no thicker than a hair, which in some cases runs completely through the stone, and when the stone is worked up, many of the pieces that have this vein of quartz through them are found to be

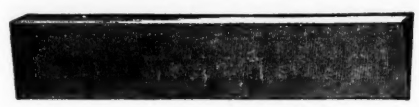
ARKANSAS TRIANGULAR.

worthless. The edge of a tool, coming in contact with the projection caused by the quartz (it being so much harder than the stone) will be continually destroyed, every time the edge passes over the stone. It is next to impossible to get stone that is entirely free from this quartz, and it requires great skill to detect it. Arkansas stone can seldom be worked in pieces over six inches in length.

Stones over six inches are worth about one third more than the short ones. Turkey stones are predisposed to seams and seldom found without. It is impossible to find pieces over six inches in length that are sound and hard. There is a peculiar kind of stone, which is found in the State of Connecticut, a great deal of which is sold for Turkey stone, but does not compare with it, in regard to its practical value. It differs in color, some being light and some dark, also different degrees of hardness. The hardest is not so hard as the best

ARKANSAS POINT.

Arkansas stone, but has about the same market value. The softest can be cut quite easily with a knife. It will probably be interesting to our readers to know how a stone can be cut, upon which the edge of a broken file has no effect, therefore I will describe the process. A square frame is made of four pieces of timber of a proportional size, and there are placed edgewise, within this frame, certain strips of soft iron, for ordinary use, ⅛ of an inch thick, and 3¼ inches wide,



ARKANSAS KNIFE BLADE.

which are so placed that the openings between these strips correspond to the thickness of the stone required.

This frame is suspended at each of the four corners so that it can be raised and lowered. This frame is connected to a crank shaft by means of a pitman, in line with the strips of iron previously mentioned, and is allowed a stroke of 16 inches and running 80

ARKANSAS DIAMOND SHAPE FILE.

revolutions per minute. The stone to be cut is placed upon a platform under this frame, (which I will now call a saw), and each of the blocks cemented together with plaster of Paris, thereby forming one solid mass.

The top is now to be covered with sand and leveled off. This sand possesses a peculiar sharpness which renders it very valuable for cutting all kinds of stone. It is taken from the beach at Northport, L. I.; is used for marble-cutting, and is sent all over the country. This sand was found after long and careful investigation. Considerable care is required in starting the saw, as it is necessary to have small streams of water running over the top of the stone, to keep the sand under the saw all the time. But after the saw has cut down so as to bear on all the blocks, the process will go on much

FLAT FILE, BEVEL EDGE.

better. After the saw gets well started the cuttings of stone are to be mixed with fresh sand and used together.

The stone is first cut into pieces 2 inches long, then reset and cut into pieces 8 inches wide, then again cut into pieces 1¼ inches, or sizes required. In each of these cases it is necessary to stick the pieces together, thereby forming one solid mass. The saws will cut from one to six inches per day, depending upon the hardness of the stone. After the stone is cut the required size, it is taken to the rubbing-bed, which is a wheel 9 feet in diameter, placed upon a vertical shaft, and runs at a speed of 50 revolutions per minute. The upper side of this wheel is faced with plates of cast iron, and is sprinkled constantly with fine sand and water. Upon this face the pieces of stone are held until they are properly finished. A great deal of skill is required in finishing some kinds of stone—for instance, the knife-blade—even a grain of sand will sometimes break the edge of the stone on account of its thin edge.

After finishing, the stone is to be washed, then placed in a close room heated by a coil of steam-pipe and thoroughly dried, the process occupying about 24 hours. They are then assorted, carefully inspected, and packed for sale. There are several points to be observed in selecting an oil stone, viz.: For hard tools requiring a keen, fine edge, the Arkansas (hard) is undoubtedly the best. For wood-working tools a little softer grade may be used. But whatever the purpose for which the stone is to be used, care must be taken to select an even grain throughout, with no hard spots. Hard spots may be detected by discolorations on the face. For wood-working tools I prefer a soft, fine stone. A stone to cut fast must be soft, and will wear away rapidly.

We will enumerate some of the different shapes into which oil stones are made, and the different purposes for which they are used. Arkansas knife blades, and points, for dentists, die-sinkers, etc.; Arkansas diamond-shape files, file slips, beveled edges, triangulars for armories, sewing machine factories, and other purposes. Pen-knife pieces, and round-edge slips, made of Arkansas, or Washita stone; also wheels for jewelers' and dentists' lathes, besides many other shapes for special purposes. There are at present five manufactories of oil stones in this country, from which stones are shipped to all parts of the world.

There is also quite a traffic in Arkansas oil stone powder, which is used quite extensively in finishing hardened metal surfaces; the stone being almost indestructible will polish the hardest steel.

The *Railway World* estimates that 400,000 persons are employed on the railroads of the United States, and that five times that many persons depend upon the roads for support. It also estimates that about $400,000,000 are paid annually to employees and to persons furnishing supplies to railroads. This enormous business is the out-growth of only fifty years, as half a century ago there was not a railroad in all this broad land.

It is thought that the heavy reductions in the price of gas made recently by the New York City gas companies will tend to foster the introduction of gas engines for light work into hundreds of shops and stores in this city. Thousands of these engines are in regular use for such purposes in English and European cities generally, but the extravagant rates demanded by the gas companies in American cities have heretofore been a great hindrance in this country, a state of things not entirely creditable to the business sa-gasity of the gas company managers.

Five executions and only two boiler explosions in one day! Is there anything wrong with the country?—*N. Y. Evening Express.*

Settlements are sometimes difficult of attainment, even with customers whose credit is above question. The most provoking instances of this kind are where the dealer takes it into his head that he knows the price better than the manufacturer, and, regardless of the terms of sale, discounts a statement at his own sweet will. Such an individual will offer, say one hundred and twenty-five dollars to settle a bill of one hundred and thirty-five, although the terms were net, and he knew it. This is a species of bulldozing which is almost equaled by those parties who neglect to pay in 10 or 30 days, and then subtract the discount with as much impudence as the man who asked, "What are you going to do about it?" Too many firms accept the situation as they find it, and, although they make a feeble protest, at last submit to extortion which should in no instance be tolerated. The manufacturer ought to know the price his goods are worth, and should compel his customers to respect the terms of sale. The "bull-dozers" seldom recall their patronage from a concern which fulfills its contracts and compels customers to act in equal good faith.—*Furniture Trade Journal.*

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NEW YORK, AUGUST 9, 1879.

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Advancing Prices and Increasing Trade.

On every hand throughout our country we see unmistakable evidences of an increasing trade, and in many of the great staple articles of commerce an upward movement in prices. No summer since the ever-to-be-remembered panic of 1873 has witnessed a maintenance of steady and buoyant prices for leading commodities until that which we are now passing through.

A constant struggle to sustain the standards of trade and an unfeigned distrust of the future have so long been the prevailing symptoms of our commercial body politic, that something more than a flutter of improvement was needed to dispel these uneasy forebodings, and give courage and confidence to those who have learned so many bitter lessons from the logic of experience. But one success begets another, and with advancing prosperity in any important industry, all others will in some measure become charged with it, as surely as electricity will pass over every good conductor within its reach. The industry that seems to have taken the lead in bringing about a better state of commercial affairs—now so evident that even chronic croakers cannot but acknowledge it—is railroading. The immediate causes of recuperation in railroad business, which have been going on for several months, appear to be abundant crops and a remarkably increasing export trade.

Certain it is we are once more upon the high road of business success and, unless unforeseen and unusually great difficulties arise, are likely to remain there for some years to come. One of the strongest reasons for gratulation is found in the steady upward tendency of the iron market.

During the summer there have been several advances in the selling price of pig and manufactured iron, and the rolling mills, both for railroad, merchant and architectural iron, are, many of them, so full of work as not to be able to fill any new orders for two to six months to come. At almost all the mills large future contracts would be positively refused at present prices. All the rail mills are pushed to their full capacity, and those standing idle for years will soon be started up. The building of new railroads has received a fresh impetus, and all kinds of supplies needed in their construction, equipment and repairs, are in gratifying demand Reliable statistics show that our grain and cotton crops are unusually large. At the same time, news from abroad reports the wheat crops of Russia, Germany, France and England as exceptionally poor, that of the last named country being almost destroyed. The French Minister estimates that his country will probably need to import $100,000,000 worth of wheat. America is the country to which all these nations will look for their breadstuffs, and our farmers may expect a good demand and somewhat higher prices for their produce.

Our export trade in manufactured goods has swollen at a surprising rate within the last half year, and is likely to expand with even greater rapidity. Many manufacturers who had scarcely any trade abroad six months ago are now exporting thousands of dollars worth every month.

Leather, one of our great staple commodities, has advanced materially in price since the beginning of summer, and leather belting has followed by a like advance. We have lately conversed with many manufacturers of machinery, who state they are selling more of their productions and obtaining better prices than for many months past. There is a demand for a better class of machinery and tools than those which were popular in the days of inordinately low prices, and a large part of the old junk sold as second-hand machinery, and in use, will shortly be broken up and its place filled by substantial pieces of mechanism. Shops, mills and factories that have been idle for many weary months of watching and waiting for better times are now starting up in every section of our Union, and hosts of idle workmen are finding employment. Then, too, the wages of good skillful mechanics have a decided upward tendency, and such men are now sought for in every manufacturing district. There are more new shops and factories building and about to be built than at any other season since 1873, and the outlook is bright and encouraging on all sides.

Striking Engineers.

London, July 27.—Nearly three hundred engineers who are on strike at Bradford are prepared to emigrate to the United States and Canada, in accordance with invitations received from various branches of the Amalgamated Engineers' Society in the principal engineering centers

The above press dispatch is suggestive of a new element of discord in the ranks of our American engineers.

There is no objection to receiving additions from foreign sources, for if the newcomers are industrious, steady, and well-qualified for their duties, situations will offer where those careless and incompetent are rejected; but we enter our protest against applying a rule for paying engineers upon a fixed scale, regardless of the amount of skill and efficiency possessed by each individual. If these men expect to establish a uniform scale of engineers' wages in any of our commercial centers they will be the most sorely disappointed lot of artisans that have emigrated to our shores for many a day.

The most ridiculous labor movement that could be started would be a strike of engineers, or machinists, for equal rates of wages in any of our large cities. If such a strike could by any means be organized, we might expect to find among its originators a full representation of lazy and incompetent lunk-heads who neither read, study, or try to improve themselves in their occupation, but who are content to plod along upon a certain average rate of pay without an effort to fit themselves for a higher grade, and a consequent higher compensation The opportunities for a mechanic's advancement are not as free in England as in America, which may in part explain the existence in that country of societies among engineers to exact uniform rates of wages. We have a number of engineers' societies in large cities, but, so far as we know, not one that assumes to regulate the amount of wages their members shall receive. We have no knowledge of the "Amalgamated Engineers' Society" mentioned in the press dispatch. All attempts to maintain machinists' or engineers' societies for securing uniform wages have failed in this country, though several organizations of the kind were made a few years ago. Good mechanics will not be burdened in their progress with drones and dissolute members of their craft, though they may impart some advice and instruction. There is no danger of fomenting strikes among engineers or machinists to secure equal pay, for in the best regulated shops hardly a workman knows what pay the man at his elbow obtains.

We wish to direct the attention of progressive engineers to a brief article by Mr. Charles T. Porter, page 4, on the subject of High Speed in Steam Engines. The question of high speed or low speed is one of the most important now before the engineering fraternity, and Mr. Porter is acknowledged to be the foremost representative of high speed in this country. We extend a cordial invitation to the advocates of low speed to controvert his positions through our columns.

New England Industrial Exhibition.

The New England Manufacturers' and Mechanics' Institute, the organization of which was noticed in our issue of July 19th, is progressing very favorably. The executive committee has issued a complete prospectus of its aims and objects, which can be had upon application. Subscriptions to the capital stock are being received at a satisfactory rate, almost all branches of trade being represented. The project has been warmly indorsed by the Governor of Massachusetts, the Mayor of Boston, and other prominent officials, who also attest their high appreciation of the integrity of the gentlemen who have undertaken to set this enterprise going.

Most of the subscribers to stock are down for $100 each, and we are pleased to see the manufacturers of machinery and tools joining the enterprise with enthusiasm. One of the grandest and most instructive features of their annual exhibitions will be machinery in motion, and it is expected that purchasers will be attracted, not only from all parts of the United States, but largely from foreign countries.

If the subscriptions continue to come in as freely as they are now being received, the permanent building will, no doubt, be erected so that the first Industrial Exhibition will be held in September of next year.

This society differs materially from any other that has ever held a general Industrial Exhibition in New England. It represents the whole of New England, while all the fairs that have been held in Boston have been under the auspices of a society representing nothing outside of Massachusetts.

Again, it is on the mutual plan, and one member has no more interest or privilege than another, except he holds a larger amount of stock. The officers are elected annually. Manufacturers who desire to be benefited by these annual fairs should send in their subscriptions for stock if they have not already done so, without waiting to receive a call from any of the projectors of the enterprise, as the benefits are to be impartially distributed, and the executive committee have nothing more to gain than the other subscribers. The whole capital stock is $100,000, and, as several hundred names are already on the subscription list, an early completion of this part of the work seems to be assured. No assessment can be made according to their charter of incorporation until all the stock has been subscribed for.

A Dangerous Half Truth.

Machinery has done a great deal of good to the world by cheapening the price of products of all kinds, but it has also done not a little towards throwing out of employment scores of honest working men and women who, discouraged by their inability to obtain work, have taken to the road in sheer self-defence. They have become the dangerous and dissolute beings known as tramps, and the outrages committed by them exceed all bounds. How the injury is to be overcome is a question yet unsolved. In the meantime, it is a somewhat anomalous and yet indisputable fact that one of the chief products of civilization, one of the natural results of the steam-engine, is the tramp!—*New York Evening Express.*

Somebody has said that half truths are more dangerous than whole falsehoods, and a half truth, such as we have quoted above, is all the more likely to convey a wrong impression to the minds of those whom it concerns, because it comes from a source so intelligent and influential. There can be no doubt that the history of mechanism has shown almost countless instances, in which the introduction of a new machine for some particular kind of work has operated to supersede hand labor, thus working temporary injury, perhaps, to the craftsmen heretofore employed in that branch.

But it has almost universally followed in such cases, that the greatly increased demand for the manufactured product consequent upon its lessened cost, has in time set the workman right, though possibly requiring him to shift from one kind of work to another, as, for example, the work of building the very machines which have thus superseded his own handiwork.

But, however that may be, none can deny that a saving, whether of ten cents or ten dollars, in the price of an article that he has to buy (even if due to the introduction of improved machinery) is as much of an object to a workman as to anybody else.

It is most undeniably true that the introduction of certain forms of the automatic machinery now in use has been the means, both of throwing large numbers of workmen out of certain kinds of employment, and of degrading those who remain into mere machine feeders at a low grade of pay.

But it remains to be proven whether the very causes, which thus operate to throw these bodies of workmen out of one particular

employment do not bring with them increased opportunities for finding other and perhaps better employment.

Does anybody doubt, for instance, that the demand for skilled compositors and pressmen in printing offices is lessened because of the introduction of the wonderful printing presses invented by Hoe and others? Is it not plain, that machinery of this sort has stimulated the publishing of a hundred books and newspapers easily and rapidly, where one would have been slowly and uncertainly produced under the old system of hand presses?

As for those so-called workmen, who choose to become mere machine drudges, it is largely their own fault if they long continue so. The fact is, the world moves, and workmen, whether machinists, or crispins, or hatters, or what not, must learn to adapt themselves to it and to move with it.

The development of our modern system of book and newspaper education, itself so largely made possible, as we have seen, by the introduction of improved machinery, is such, that craftsmen as well as capitalists can train themselves at a trifling expense, if not to invent new machines out of their own heads, at least to do skilled work in building them, which it will trouble inventors to reproduce by labor-saving devices.

To any one who will examine this matter, ever so slightly below the surface, the fact is as evident as it is pleasant to record, that at this very moment *really skilled workmen*, in every branch of the trades represented by this journal, are as anxiously sought after and as well appreciated as they have ever been since the first labor-saving machine was thought of or invented.

The chief difficulty in the case is, that so many workmen, if they read at all, prefer to drown out their brains in the floods of trashy stories now so prevalent instead of learning to think, and thus fitting themselves and their children for a better life and a higher place in the world.

Looking at the tramp question, therefore, in its relations to our system of labor and laws, the true solution of the problem lies in directions quite different from that indicated in the extract at the head of this article. What one of those directions is, has been, from time to time, pretty freely pointed out in these columns.

But as to the steam-engine, whether referring to the tramp-producing problem or to any other of the living topics of the time, the beneficent power which has worked and is daily working so many wonders for the comfort and convenience of so many hundreds of millions of the poor and rich alike in every part of the world, needs no defence at our hands.

A Modern Blue Law.

Of all those credulous Americans who plume themselves upon the idea that they are living under the freest government in the world, probably very few are aware that an important and growing class of our fellow citizens are being daily and systematically oppressed in a manner shameful to relate.

We refer to that large and enterprising body of our fellows, who, as a consequence of variously flagrant degrees of crime, are confined, at hard labor, within the walls of our State and City Penitentiaries throughout the country.

Not even extenuating circumstances, such as the clearest and most incontestable proof that a certain prisoner is "in" for the crime of homicide done to a natural enemy of society, as, for example, a hotel clerk, a Savings Bank director, a baggage smasher, a boiler exploder, or a youth who wears his watch chain on the outside of his coat, and parts his name, as well as his hair, in the middle,—it seems, avail in the least to weaken the grasp of the remorseless tyranny which we are about to describe.

It is true that to the careless observer, the criminal branch of our body politic are accustomed to enjoy what may perhaps be regarded as special and very considerable privileges, in view of their relations to the law and the public at large, but it is most inhuman and unjust to plead these concessions in palliation of the wholesale tyranny which is now discovered to be a matter of daily practice everywhere.

Therefore, it is not necessary to notice the fact, that the sentences of hard labor passed upon such of these culprits as may happen to possess wealth or influential friends, are usually practically nullified, by placing them in snug and easy office berths, requiring no severe or distasteful labor.

Nor, for a like reason, is it necessary to enlarge upon the privilege enjoyed by even the poorest of these convicted rebels against society (thanks to the Prison Labor Contract system, which lets out their labor at 40 cents a day), of bringing a dozen honest workmen and their families down to a condition of squalor, if not of actual starvation, and thus damaging the public far more by their punishment than they were ever able to do by their crime. Assuredly, trifles such as these can be no offset to the oppression, which it becomes our paramount duty to chronicle.

The latest and most striking instance that has come under our notice, brings out in bold relief the startling fact, that in all our prisons throughout the length and breadth of the land, the course of true love between prisoners of opposite sexes is being daily and hourly thwarted and trampled upon by heartless wardens and keepers in a manner most pitiful to relate. Yet such is the depravity of newspaper editors and subeditors, that outrages of this sort are usually regarded only as affording material for merriment.

Witness what happened the other day to Paul Helt, a convict in one of the Pennsylvania prisons, who was ruthlessly torn from his fellows and placed in solitary confinement for making love to a female prisoner named Alice McGlue.

"Although forty-five years of age Paul is as hale and hearty as a three year old colt, and that he loves Miss McGlue to distraction is quite evident. Miss McGlue is not pretty to look at, for the fifty years she has spent in and out of jail have left her rather broken up; but still in the eyes of her lover she possesses innumerable virtues. A few days ago one of the keepers discovered that a clandestine correspondence was being carried on by the pair, and when searched a number of *billet doux* were found in Paul's pockets. The following is a sample:

Monday

My darling Misses McGlue

I write to say I love you betir than I do anny one in the World. Look at me when you go past me. We will be very happy in our love yet. Dont you give me away for i am yours with undiing love PAUL HELT.

Whether Miss McGlue returned Paul's ardent love is not known, but at any rate she did not violate the prison rules by writing to him nor did she "give him away." The officers warned him not to have any more such epistles written or he would be punished, but this did not deter him from telling his love, and on Wednesday he was again caught trying to give a note to Miss McGlue. He was forthwith placed in a single cell and will hereafter be carefully watched.—*Pottsville Miners' Journal.*"

Now, if such things were related as occurring even in a semi-barbarous country, such as Russia or Siberia, we might find them difficult of belief, as it is well known that even in Siberia (provided they can stand the cold weather) the loves of exiles and prisoners are avowedly encouraged instead of being snuffed out in this base fashion.

But if it was reserved for our free and happy people to note the beginnings of this odious system, let it also be our task to utter the words that the illustrious dramatist might have put into the mouth of the noble Roman patriot:

"Shall we be slaves,
And stand such plaguey nonsense?"

Happily, in this land of free speech and an unshackled press, grievances need only to be stated often enough and forcibly enough to be redressed. Let us hope that this particular grievance will shortly consign itself to the limbo, where slumber the hated Blue Laws of our once oppressed but now restored New York and New England.

Moulders and foundry men, who know how to do work and can tell others how to do it, are especially invited to send us descriptions and drawings of the same for our reading columns.

The British Trade Tangle.

The industrial and business depression in England has seemingly now reached the point of notoriety, which will soon require John Bull to stop blinking the question, and to begin putting his house in order.

Notwithstanding the all-powerful sentiment favoring free trade, a strong and growing party is forming in England which is disposed to lay the whole blame of these accumulated troubles upon that dogma.

John Bright, at the head of the free trade party, as strenuously shifts the responsibility to the primogeniture system which has been handed down from feudal times.

Meanwhile, the nobility and heavy land owners say nothing, while the tens and thousands of sons and daughters, whom the land laws practically disinherit, go on drawing pensions that never should have been granted, and filling lavishly paid sinecures that never should have been created, with most exemplary regularity.

The farmers and yeomanry, as a class, alternate between complaints of the weather and poor crops, and helpless bewailing over the impossible task they have on hand, viz.: trying on rented land, worth $300 an acre, to compete with free Kansas lands, worth $2.00 to $10.00 per acre.

The fact is, John Bull is not an adaptive individual. He is trying to continue the systems and institutions that came in with William, the Norman, in an age when half the ten-year old boys of the period are able to discount that redoubtable bastard in numberless acquirements.

Primogeniture and the nobility system were all very well, when to be able to sign one's name was counted a liberal education. To-day they fill the land with a struggling swarm of genteel paupers, too proud to work, and often too indolent and pleasure-loving to fill respectably the sinecure places created for their benefit, while the lucky "heads" of the landed families spend their uncounted thousands in absenteeism and lavish ceremonial.

Scolding the weather has doubtless been, and will always be, a satisfaction to those who suffer by its caprices, but the great point is to indulge that pleasure under institutions which are favorable to financial recovery as soon as the weather clears.

Absolute free trade would have continued to work well for England, perhaps, (with the major part of her working population glad to toil on pauper's wages) if John Bull had only not left out of the account the cute Yankee, and his inborn tendency to protect his own industrial interests by tariffs in general, and to invent new machines in particular. As it is, England finds free trade a gun which shoots from the breech, the very nations whose products she admits free being shrewd enough to tax hers. Meanwhile, a moderate protective tariff, combined with natural advantages, has put Brother Jonathan in position to bag the game.

Her laws regarding the unlimited liability of stockholders, as exemplified in the recent Glasgow Bank troubles, form another tangle that England has speedily to unravel.

Altogether, it is a very pretty snarl that the anxious Briton has before him, but he will never get it straightened until he widens his capacity for reform, and throws overboard at once a full half-dozen of his most cherished institutions.

What a Reader Thinks of Us.

The following letter is a sample of the letters we are continually receiving. We take the liberty of publishing it, and should be glad to publish some of the others if our space would permit.

DEAR SIRS:—I think I can say that the two years that I have taken your paper I have had more useful information than the five years that I have taken the ——— ——— As I am learning to be an engineer it is just the paper I want—every kind of, or piece of machinery or engine ever built is explained so that if an engineer never saw it he can run it the first time he sees it, which is very valuable to a person that shifts from one machine or engine to another.

And then, not only is it scientific, but comical; the articles under Chordal's letters, and Stopper and Starter are very interesting. A person studying the rest of the paper on machinery and figuring on this and that, with an occasional scratch at his head because he does not quite get the meaning of an article, with a sober face he reads them all till he comes to Chordal or Roper's, and then down comes the hand to the sides to hold them in while he has a laugh at the queer engineers and machinists they tell about; and I think, and so does everybody who reads the paper, that it makes it more interesting, as it is a change, and not like a dictionary, all the same thing all the way through.

I asked several if they did not want to subscribe for it, they said no, it was nothing but an advertising sheet; I then showed one to them, and the next time I saw them they wanted your address. I think they changed their minds about it. J. MORGAN,

500 Scoville Ave., Cleveland, O.

Machine Shop Wages.

We give below rates of wages paid by a number of firms in Philadelphia. When the lower cost of living, in the matter of house rent, as compared with New York, is taken into account, it will be seen that these rates are more liberal than some that we have heretofore reported from other sections.

Wile, Seidel & Co., Philadelphia, pay crucible turners, $20.00 per week; laborers, $9.

Fairmount Machine Works (Thos. Wood), Philadelphia, pay machinists an average of $12.00 to $15.00 per week, some of the better workmen receiving more; moulders get $11.50 to $13.75; helpers, $9.50; blacksmiths, $13.00 to $17.00; pattern makers, $13.00 to $18.00; millwrights and carpenters, $12.00 to $18.00 per week.

Wm. T. Bate & Son (Montgomery Boiler and Machine Works), East Conshohocken, Pa., pay boiler-makers an average rate of $2.00 to $2.50 per day; blacksmiths, $3.00; pattern makers, $13.00 to $14.00 per week; machinists, $12.00 to $13.00 per week; moulders, $12.00 to $13.00; helpers, $9.00 per week.

L. B. Flanders' Machine Works, Philadelphia, pay machinists an average of $12.00 to $18.00 per week; some receiving more than the highest, and none less than the lowest, amount named.

Edwin Harrington & Son, Philadelphia, pay machinists an average of $10.00 to $18.00 per week.

The Otto Silent Gas Engine Works, of Schleicher, Schumm & Co., Philadelphia, pay lathesmen an average of $10.20, and vise hands, $12.00 to $13.50 per week; the greater part of their work being done by contract.

The Stow Flexible Shaft Co., Philadelphia, pay machinists an average of $2.00 per day; helpers, $1.00; the greater part of their work being done by contract.

Alexander Krumbhaar (Philadelphia File Works) pays forgers, $11.00 per week; grinders, $10.00; cutters, *net list.*

Business Specials.

Thirty cents a line for each insertion under this head.

For Screw Cutting Engine Lathes of 14, 15, 18, and 22 in. Swing, address Star Tool Co., Providence, R. I.

The Huntoon Steam Governor Co., of Lawrence, Mass., warrant a direct saving in steam of from 10 to 20 per cent. over any other Governor known; while for quick and accurate regulation, great durability and lasting economy in use, they guarantee results never before attained by any other. See advertisement.

Brown & Sharpe M'f'g Co., Providence, R. I., keep in stock at reduced prices Patent Cutters for the teeth of gears which can be sharpened by grinding without changing their form. All wheels of same pitch cut with them will run together correctly. Send for new catalogue.

National Steam Pump, simple, reliable and durable. Send for illustrated catalogue with reduced price list. W. E. Kelly, New Brunswick, N. J.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) Economy, of Baltimore, Md., writes: I have a 15 H. P. boiler, and a 10″x40″ engine. I have always run with 40 lbs. pressure of steam per square inch, but I find that 25 lbs. pressure will give me all the power I need at present. Is there any economy in running at low pressure? A. There is no economy in working steam at low pressure in the manner which you describe. A cubic inch of water converted into steam at a pressure of 40 lbs. shows a temperature of 269.1 degrees, volume, 679 cubic inches; whereas, at a pressure of 25 lbs. it shows a temperature of 241.0 degrees; volume, 1044 cubic inches. It will be seen by the above, that high pressure steam, indeed, is just low pressure steam forced into less space, and the pressure will always be great in proportion in which the space is contracted. In other words—if a cubic inch of water makes a cubic foot of steam with the pressure of one atmosphere, it will make half a cubic foot with the pressure of two atmospheres, a third of a cubic foot with the pressure of three atmospheres, and so on, in all other proportions. It will be understood that the elasticity increases with the pressure, so that to obtain the best results in your case, we would recommend that you carry 40 lbs. pressure per square inch, and work the steam expansively. Set the valve of your engine so as to cut off shorter, thereby getting the economical results which may be derived from expansion. You will have to either get a new valve, or fasten a strip of metal to each end of the one you now have, in order to maintain the present position at the commencement of the stroke.

You do not state at what point the valve cuts off, but should it be about ⅔ of the stroke, we would recommend that you alter the valve so as to cut off at ½ stroke, that is, if your engine has only a plain slide valve, without an independent cut-off. If you wish to get at the results by this change, weigh your coal carefully, and measure the water used before you make the change, and do the same afterward, when the economy will become apparent.

(2) J. A. F., Rockford, Ill., writes: Please tell me through your questions and answers in the American Machinist, 1—What is the best rule for finding the weight of the ball on safety-valve? 2—Who publishes the best work on Compound engines? A. 1. *Rule for finding weight necessary to put on a safety-valve lever when the area of valve pressure, etc., is known.*

"Multiply the area of valve by the pressure in pounds per square inch; multiply this product by the distance of the valve from the fulcrum; multiply the weight of the lever by one-half its length (or its center of gravity), then multiply the weight of valve and stem by their distance from the fulcrum; add these last two products together, and subtract their sum from the first product, and divide the remainder by the length of the lever, the quotient will be the weight required.

Note.—The distance of lever's center of gravity from fulcrum may be measured (after balancing lever with valve attached) on a sharp edge. This is a necessary point, particularly where the lever is not of a uniform thickness throughout.

2 There are two small treatises on the compound engine; one by A. Mallet, and the other by John Turnbull, Jr., at 50 cts. each, but the best work that we have ever seen, and the most extensive, is embodied in The Engineers' Practical Guide and the working of the steam engine, explained by the use of the indicator. By J. Hopkinson & Co., Huddersfield, England. Price about $5.00.

Compounding is still a matter of speculation, and each of the books mentioned contain good things on the subject.

(3) J. P. & Co., Littleton, N. H., asks: Will you tell me through your valuable paper, the difference between a low pressure boiler and a high pressure? Have asked several, and no one knows. I have a 6£ H. P. boiler, just bought, and wish to post myself a little, as the old steam gauge did not work, and we have put on a new one. A. Low pressure boilers are generally made of iron from ¼ of an inch to 5-16 of an inch in thickness, with a large area of surface, and are calculated to carry a pressure of steam not to exceed two atmospheres, or 30 lbs. to the square inch. Whereas, high pressure boilers are built of iron, varying in thickness from ⅜ of an inch, for small boilers, up to 1 inch, as in the case of some ocean steamers, and carry a pressure of steam from 30 lbs. per square inch, up to 140 lbs. A high pressure boiler can be worked as a low pressure, but a low pressure cannot carry high steam with safety, as the iron is not calculated to stand it. We know of cases where the drawings for low pressure boilers have been used, in constructing for high pressure, by using thicker iron. You have given us no dimensions, size of boiler, thickness of iron, etc., therefore we cannot say whether your boiler would be safe in carrying high steam.

The Weight of a Locomotive.

Conversation overheard on a suburban train:

Young lady, watching a Pennsylvania standard passenger locomotive, 17 by 24 in. cylinders, on an adjoining track: "Those engines are awful heavy, aren't they? I wonder what one of them weighs."

Second young lady: "Well, I should think that one must weigh nearly a ton; it looks pretty large."

Young man, with superior knowledge: "Oh, more than that. You see there's the boiler, that's all cast iron, you know, and that's heavy; then there's those round things in front, the—the cylinders they call them, they're solid brass; and then there's the wheels, all steel, you know, altogether it mounts up, and an engine like that'll weigh four—yes, pretty nearly five tons."

Young ladies, in chorus; "As much as that? Ain't they awful heavy!"—*Railroad Gazette.*

Manufactures.

The Buckeye Steam Engine Co., New York, have furnished two engines to the Merrimac Print Works, at Lowell, Mass. They have been put directly into the jack shaft, thus dispensing entirely with gears and belts. Their cylinders are twenty-four inches in diameter by three feet stroke, and run at a rate of speed of 160 revolutions per minute. This gives an average piston speed of 960 feet per minute, the greatest piston speed at any point in the stroke being 1,508 feet per minute, when the average is as above.

W. Parker Bement has been admitted to the firm of Wm. B. Bement & Son, Philadelphia.

Those of our American Machinery Manufacturers who are doubtful as to the paying qualities of a good live display in Exhibitions, such as that which is to occur next year at Melbourne, Australia, would do well to note the experience of the Stow Flexible Shaft Co., of Philadelphia. Notwithstanding the favorable reception which the Stow shaft has met with in this country, it is a singular fact that up to date this company's export trade has been larger than the home demand, due mainly to their handsome displays at the Philadelphia and Paris Exhibitions. Their foreign orders come from Spain, Italy, Norway, Germany, and South America, as well as from territory less remote. Deere & Co., of Moline, Ill., after a trial purchase of one shaft eight months ago, are now ordering five more for immediate delivery. The Buckeye Engine Co., Cambria Iron Co., the Pennsylvania, Lehigh Valley, and Grand Trunk Railway Companies, and other large corporations are also users of the Stow Shaft. Mr. George Burnham, Jr., treasurer of the Stow Flexible Shaft Co., is the son of the senior partner in the Baldwin Locomotive Works, and a nephew of Charles Burnham, of Charles Burnham & Co., the well known Philadelphia manufacturers of gas stoves.

The St. Jo. Valley Furniture Company, located at Mishawaka, Ind., have filed articles of incorporation.

Wm. T. Bate & Son, East Conshohocken, Pa., are furnishing their Drop Bottom Duplex Steam Boilers for the new Pennsylvania State Insane Asylum, at Norristown; also nine hot-water heaters for the same building. They are also taking out plain cylinder boilers and replacing them with their patent duplex boilers, for Worrall & Ratcliffe, Bridgeport, Montgomery Co., Pa.

As an illustration of the upward wave that is swiftly and surely floating the iron manufacturing interests into good business, we are pleased to note that J. B. Moorhead & Co.'s iron furnace, at West Conshohocken, Pa., which has been out of blast for several years, is now starting up. Also, Jesse W. Starr, Jr., has leased, and is now running, the pipe and machine works at East Conshohocken, formerly run by S. Fulton & Co., but which have been shut down since 1874.

The employees of the Pennsylvania Iron Works, at Danville, were notified on the 19th inst. that their wages would be advanced, dating from July 1st. The price now paid for puddling is $3 per ton.

Chicago's 22 boiler manufacturers are all running their full number of hands and report a bright outlook for the future. Two are contemplating increasing their present facilities for manufacture.—*Com. Adv.*

Watkins & Keeler, a new firm from Pittsburgh, will shortly erect a large boiler manufactory on the north side, Chicago.

Thomas and Gilchrist, at Bulckow's Works, England, have been experimenting for some time in a new and cheap process for making steel, and have been successful. The principal feature is in the lining of the furnace. This process is said to be likely to entirely revolutionize the manufacture of steel.

Summit, Mississippi, is to have a cotton factory soon. There are already nine cotton factories in the State.

Aberdeen, Mississippi, will have a cotton manufactory the coming fall.

The dimensions of the cotton factory now being built at Bethania, N. C., are 50×250 feet, and two stories high.

The Edgar Thomson Steel Co., of Pittsburgh, write us: "We can accept no orders for boiler slab, having as many orders for steel as we can make this year."

The Hartford Machine Screw Co., of Hartford, Conn., write us: "We are refusing orders continually." This is in consequence of having too many orders on hand.

The Brainerd Milling Machine Co., Boston, are getting out a new illustrated catalogue with new engravings.

The Philadelphia and Reading Railroad Company are building fifty tool houses at their Pottstown shops, to be placed on the Bound Brook Branch.

T. H. Brooks' foundry, Cleveland, which makes a specialty of steam-heating apparatus, is employing forty men full time, and the proprietor complains of the difficulty of getting mechanics. He has just received an order for 12,000 tubes for radiators for the Ohio Penitentiary, at Columbus.—*Engineering News.*

Iowa City will establish water-works if the necessary stock can be sold.

The citizens of Toronto, Can., will vote on the 13th of August, on the question of issuing bonds for $116,000 for extending the city water-works; also $25,000 for an iron bridge over the River Don.

It is reported that G. W. Bent, of East Bridgewater contemplates starting a foundry at Brockton.

The Portsmouth, O. Iron and Steel Co. have broken ground for a large steel mill. They have the old Gaylord rolling-mill in full blast and are running full handed.

Of Chicago's 27 brass foundries, 25 are in full operation this summer.

Extensive additions are now being made to the factory of B. F. Sturtevant, the well-known manufacturer of blowers and exhausters, at Jamaica Plain Station, Boston.

LITERARY NOTES.

THE UNIVERSAL ASSISTANT AND COMPLETE MECHANIC, containing over one million industrial facts, calulations, receipts, processes, trade secrets, rules, business forms, legal items, etc., in every occupation, from the household to the manufactory. By R. Moore, New York. Illustrated with 500 engravings. Ninth Edition. Price, $2.50.

This valuable and popular work has already run through eight editions, and the new revised and enlarged edition now before us bears evidence of diligent study and careful research in every department of industry. It contains 1016 closely printed pages, and the contents are systematically arranged. The machinists and engineers' department is the fullest and most thorough of any, as indeed it should be, to make the work one of especial value. The information is brought down to the latest date, and is presented in plain English, without algebraic formulas or mathematical puzzles of any kind. The best sources have been used for material to fill the pages, while untested theories and irresponsible statements have been avoided. The author has spent a number of years in collecting his material, and the last edition is the most complete and valuable of any work of its kind that has come to our notice. The department of mining information is well presented, and the mechanics' laws of different States are carefully and practically arranged. The whole work, especially the mechanical part, is plainly illustrated.

We have received from Poole & Hunt, Baltimore, Md., a new illustrated descriptive pamphlet and price list of Poole & Hunt's Leffel Turbine Water Wheel. It contains 66 pages, and is profusely illustrated and accompanied by valuable tables and other information for users of water power.

We have also received from the same firm an 87 page pamphlet, giving a list of gearing pulleys, etc., and tables valuable for machinists' use.

Machinists' and Engineers' Supplies.

Trade is brisk in every department, with an active demand and a stiff upward tendency in prices. This healthy condition of affairs is thought to be permanent; goods are bought freely, because they are needed, and because nobody thinks of lower prices as possible for perhaps years to come. Furthermore, the manufacturers, generally, have found out that more goods can be sold on a rising than a falling market.

The upward tendency in all Iron supplies is still strong, with a brisk demand and good prospects of trade.

The valve and steam fitting manufacturers have recently advanced their prices about 10 per cent., another of the gratifying signs now so numerous, which go to show that things are on the up grade.

The manufacturers of Iron Pipe have recently advanced their prices about 10 per cent., and it is confidently predicted that another advance will speedily follow.

Those consumers who have been of late borrowing their wives' pin money, to enable them to take advantage of the expected rise in prices of Leather Belting, have struck it right this time, the manufacturers of this important staple having likewise been and gone and done it, in the shape of an advance in prices amounting to about 10 per cent. This rise is rendered necessary by the recent advance in the price of leather.

The manufacturers of Rubber Belting, Packing, Hose, &c. have had a warm and tough time of it during these midsummer weeks, in endeavoring to settle upon a fair basis of prices for their goods. Most of the 16 manufacturers represented were strangers to each other when the first meeting was called, and naturally there was considerable backing and filling, in view of the fact that Rubber goods can be adulterated to any extent, and that some of the manufacturers have not stood up to the racket in the matter of quality, as firmly as the sterling old houses have done throughout the entire season of depressed prices. Several times during these meetings things seemed to be fixed up nicely, and as often had to be settled over again. Luckily, however, the tempers of the gentlemen involved have proven to be as elastic as the material of which their goods are made, and it is believed now that the vexed question is settled for some time to come.

The New York Rubber Co., 84 Beekman St., New York, inform us that a reduction in the entire list has been made, amounting to about 30 per cent., and that all the manufacturers have agreed upon a new list and system of discounts, the net result of which to the consumer will be a moderate but necessary advance.

We note a few items of detail under the new arrangement.

In Endless Belts, made to order, three extra feet will be charged for the splice, as heretofore, and 10 per cent. additional on the net price of the Belt will hereafter be charged.

In Hose, all intermediate sizes will be charged for at the list price of the next larger size, thus: ⅞ inch will be charged at 1 inch price.

In Steam Packing, 5 cents per pound additional will be charged for each extra ply of cloth.

A change in the manner of selling Packing has also been agreed upon; hereafter it will be sold *in plies*, the same as Hose.

W. T. Bate & Son, of the Montgomery Boiler and Machine Works, East Conshohocken, Pa., are introducing a new Circulating Grate Bar, for use under steam boilers.

The Rue Manufacturing Co., Philadelphia, Pa., have recently brought out an improved pattern of their Little Giant Locomotive Injector, which is reported as being very successful.

H. Prentiss & Co., 14 Dey St., New York, are daily expecting an invoice of an improved tap wrench, from the Billings & Spencer Co., of Hartford, Conn.

Situation Wanted—Help Wanted.

We will publish notices suitable for the above headings, applying to any of the machinery trades, and not to exceed four lines each (32 words), at the nominal rate of twenty-five cents for each insertion.

WANTED—SITUATION.

Have had 1½ years experience in making Surgical Instruments. Wish to learn the machinist's trade. Best recommendations. Chas. E. Eisile, 95 E. 8th St., New York.

NICHOLSON FILE CO.

SOLE MANUFACTURERS OF

FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS and SPECIALTIES.

"Nicholson File Co's" Files and Rasps.
"Double Ender" Saw Files.
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"Racer" Horse Rasps.
Handled Rifflers.
Machinists' Scrapers.
File Brushes, File Cards.
Surface File Holders,
Vise File Holders.
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Improved Butchers' Steels.

Manufactory and Offices at **PROVIDENCE, R. I., U. S. A.**

W. S. MIDDLETON,
BROKER IN
Railroad, Mining and Steamship Supplies,
MACHINERY, HARDWARE AND TOOLS
of every description.
52 JOHN STREET, NEW YORK.

☞ Manufacturers of Machinists', Engineers', Railway and Mining Supplies of every kind are requested to send me their latest catalogues and trade prices.

NORTON'S
Solid Emery and Corundum Wheel.

The Best Solid Wheel in use. Will not Glaze, Heat, nor smell, and will run equally well, Wet or Dry.

SATISFACTION GUARANTEED OR NO PAY.

F. B. NORTON, Patentee and Manufacturer,
No. 41 Water Street, Worcester, Mass.

THE·STOW·FLEXIBLE·SHAFT·CO·LIMITED.

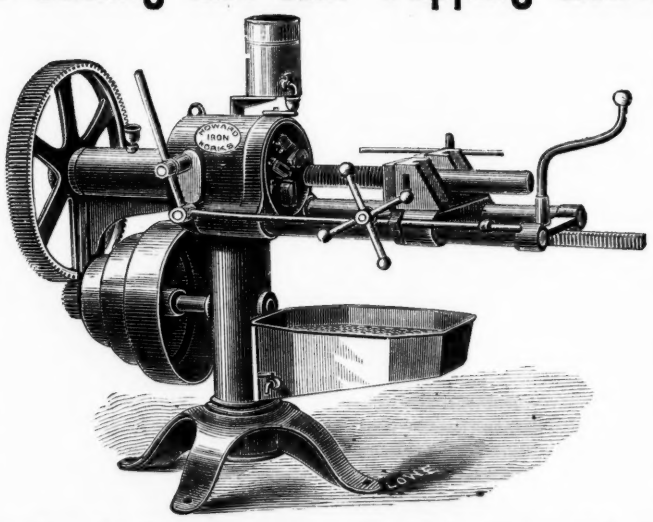
As this shaft transmits power through any number of curves, its value in the railroad and general machine shop, is at once apparent. We have designed, and keep in stock, a series of special tools for use with the shaft, as:- PORTABLE DRILLS for metals; AUGER CHUCKS for wood; CLAMPS for emery and buffing wheels, etc.

CATALOGUE and PRICE LIST, on application.

500·NORTH·FIFTEENTH·ST·PHILADELPHIA.

SCHLENKER'S
Screw Cutting and Nut Tapping Machines,

Seven Different Sizes.



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The Most Simple, Rapid, Strong, Durable, Powerful, Accurate, and Has More Good Points than any other Bolt Cutter in the World.

HOWARD IRON WORKS, Buffalo, N. Y.

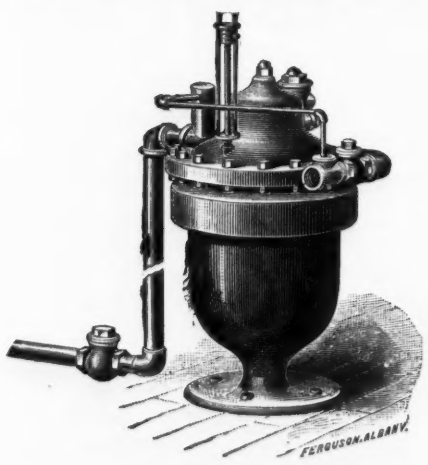
STEEL CASTINGS

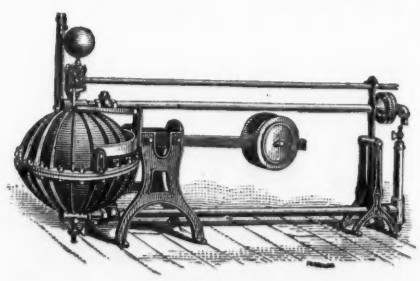
FROM 1-4 TO 10,000 lbs. WEIGHT.

True to pattern, sound and solid, of unequalled strength, toughness and durability.
An invaluable substitute for forgings or cast iron requiring three-fold strength.
Gearing of all kinds, Shoes, Dies, Hammerheads, Crossheads for Locomotives, etc.
12,000 Crank Shafts of this steel now running proved superior to wrought iron.
CRANK SHAFTS, CROSSHEADS and GEARING specialties.
Circulass and Price Lists free. Address

CHESTER STEEL CASTINGS CO.
Works, CHESTER, Pa. — 407 Library St., PHILADELPHIA

THE ALBANY STEAM TRAP.





This Trap automatically drains the water of condensation from HEATING COILS, and returns the same to the Boiler, whether the coils are *above or below* the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes.

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ALBANY, N. Y.

POOLE & HUNT, BALTIMORE.
MANUFACTURERS OF
THE POOLE & HUNT LEFFEL TURBINE
WATER WHEELS,
MACHINE MOULDED
MILL GEARING,
SHAFTING, PULLEYS AND HANGERS,
STEAM ENGINES AND BOILERS,
MIXERS FOR FERTILIZERS AND CHEMICALS.

THE
GARDNER GOVERNOR
"PERFECTED."

ASSURES
ACCURATE REGULATION,
AND
ABSOLUTE SAFETY.
VALVES and SEATS.
INDESTRUCTIBLE.
11,000 in use.

Address ROB'T W. GARDNER,
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Cook & Beggs,	New York.
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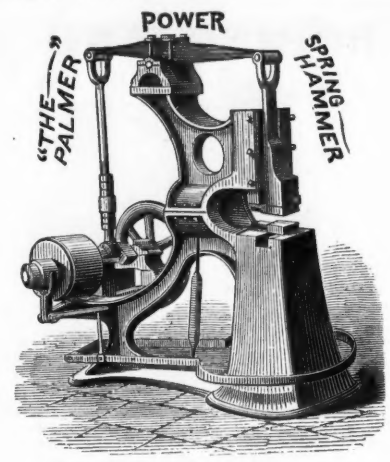
H. D. Coleman & Bro.,	New Orleans.
James Jenks,	Detroit.
Berry & Place,	San Francisco.
Hendrie & Balthoff Co.,	Denver.
Lovegrove & Co.,	Philadelphia.
Ainslie, Cochran & Co.,	Louisville.

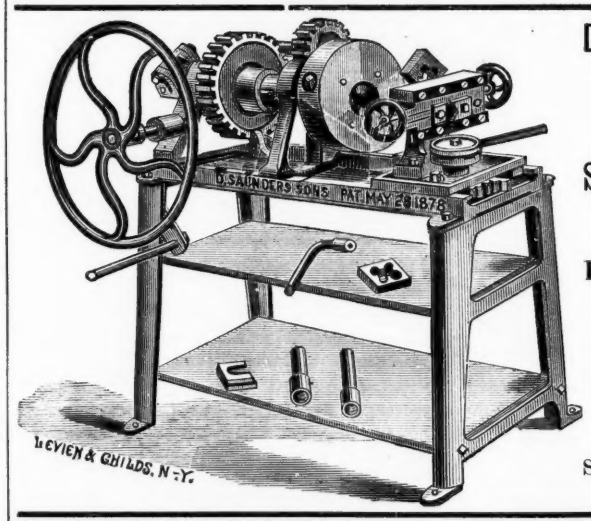


Power-Hammers,
Bolt-Forging Machines.
Machinists', Blacksmiths', and Wood-Working Tools a Specialty.
S. C. FORSAITH & CO.,
Manchester, N. H.

GEO. B. GRANT,
MECHANICIAN.

GEARS of all kinds and sizes.
GEAR CUTTING of all descriptions.
Good work at low prices.

GEAR CUTTERS best and cheapest.
SMALL GEARS, a large variety always on hand.
100 Beverly St., Boston. Send for Circular.



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Manufacturers of
Steam and Gas Fitters'
TOOLS,
Pipe Cutting & Threading
MACHINES
For Pipe Mill Use, &c.,
A SPECIALTY.

Send for Circular, and say where you saw this advertisement.

HOISTING MACHINERY and ELEVATORS Safe, Durable and reasonable in price.

FRICTION CLUTCH PULLEYS AND CUT OFF COUPLINGS.

We manufacture the "Giant Friction Clutch Pulley," known as the "Captain." Is the **Best in the World** for connecting the gearing of callender rolls, hoisting coal, logs or freight. Our Clutch can connect any amount of power at any speed, without slacking the motive power in the least and gives no shock, is easy to ship and unship, in *fact* this is the only Clutch that can do heavy work satisfactorily. Can be seen with power applied at 95 and 97 Liberty Street, N. Y.

D. FRISBIE & CO., New Haven, Conn.

Established 1866.
THE FAMOUS
HUNTOON STEAM GOVERNOR

INSURES A DIRECT SAVING IN STEAM OF FROM 10 TO 20 PER CENT. OVER ANY OTHER GOVERNOR KNOWN, WHILE FOR QUICK AND ACCURATE REGULATION, GREAT DURABILITY AND LASTING ECONOMY IN USE, THIS IS FAR IN ADVANCE OF ALL OTHERS.

Largely in use by U. S. Government, also by leading Manufacturers in all classes of Work.

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THE BEST STEAM PUMP in AMERICA
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MORE THAN 4,500 IN USE, JANUARY, 1879.

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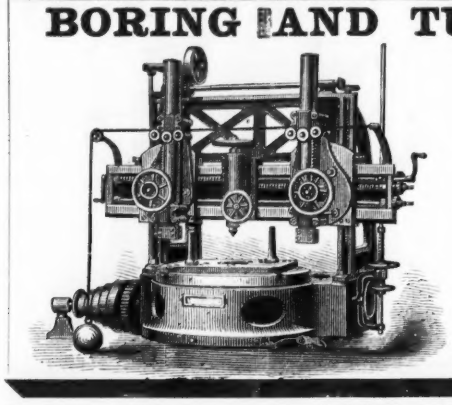

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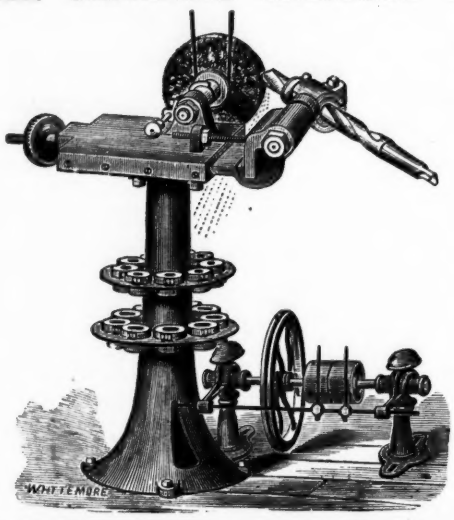

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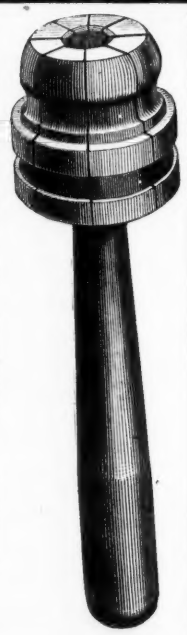

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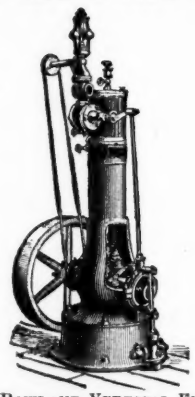

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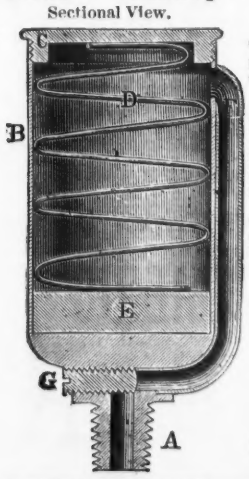

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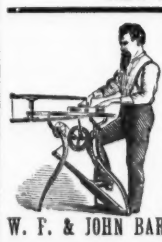

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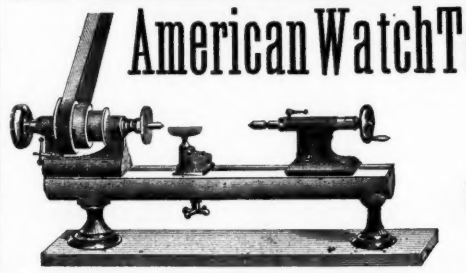

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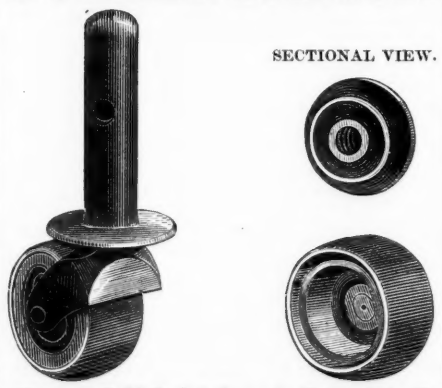

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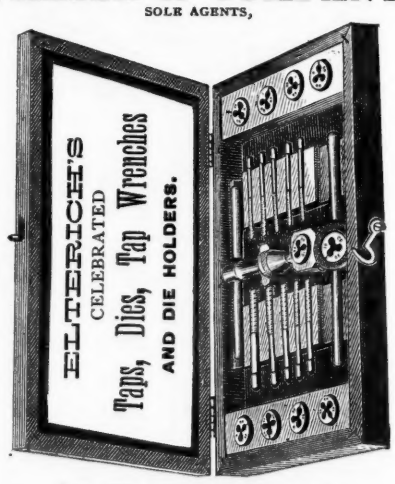

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WEEKLY REVIEW.

NEW YORK, AUGUST 5TH, 1879.

Prices have continued to advance, and we now quote as below, which prices were made August 1. The mills are all full of work, and orders are placed with difficulty for any reasonable delivery. Where the sudden demand has come from, that has in so short a time completely turned around the relations between buyer and seller, seems a mystery. But the seller's turn seems to be approaching (if not already here) to be independent enough to dictate his own prices and terms. The advance in old rails has attracted considerable shipments from abroad, and yet it is believed the country can easily absorb all coming, as the domestic supply seems for the time about exhausted. Pig Iron holds easily the advance and will unquestionably go higher if present demands continue; in fact, just the state of affairs exists that makes it wise for any one with future obligations to cover now. The Iron and Steel Rail Mills are full of work, many of them for many months ahead.

Railway Supplies generally are very firm.

The rates out of store are as below: No. 1X Pig Iron $19.50 per ton; Iron Rails, $42.00 to $44.00 per ton, according to weight; Old Rails, $25.00 to $26.00 per ton; Fish Plates, $2\frac{2}{10}$c. per lb.; Railway Spikes, $2\frac{3}{4}$c. per lb.; Bolts and Nuts, $3\frac{1}{2}$c.; Common Iron, 2c. basis from store; Refined, $2\frac{2}{10}$c. basis; Ulster, $3\frac{1}{2}$c. basis; Machinery Steel, 5c.; Best Tool Steel, 12c.; Norway Bar Iron, $4\frac{3}{4}$c.; Norway Shapes, $5\frac{1}{4}$c.; Nail Rods, $5\frac{1}{2}$c.; Sheet Iron, $2\frac{8}{10}$c.; Angle Iron, $2\frac{6}{10}$c.; Tee Iron, 3c.; Band Iron, $2\frac{5}{10}$c.; Hoop, $2\frac{7}{10}$c., up; Horse Shoe, $3\frac{1}{10}$c.; Tank, $2\frac{6}{10}$c.; C No. 1, $2\frac{3}{4}$c.; C H, No. 1 Shell, 3c.; Best Flange, $4\frac{3}{4}$c.; Boiler Rivets, $3\frac{1}{2}$c. per lb. Hot Polished Shafting in lengths two feet and longer, from 5 to 6c. per lb., according to size. Small Black Rivets, 50% off in papers, 35% off in bulk.

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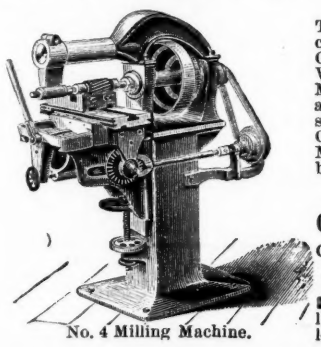

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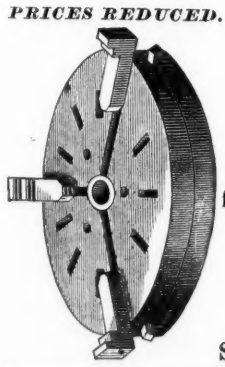

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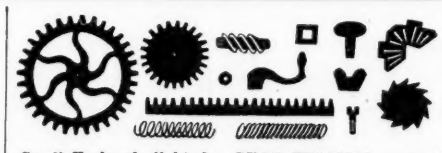

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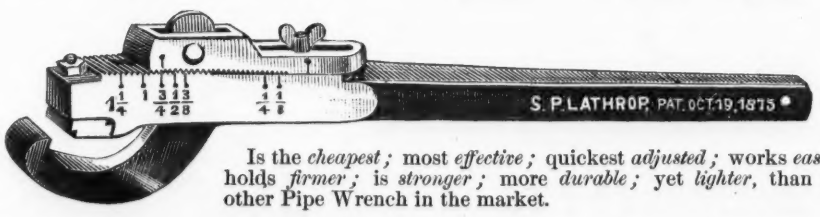

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Strength of Steam Boilers.
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Chas. A. Hague. June 28, August 2, 1879.

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Steam Engine Cut-Offs.
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Our American Mechanical Engineers.
No. I. Portrait and Biographical Sketch of Wm. Sellers. June 28, 1879.
No. II. Portrait and Biographical Sketch of Wm. Wright. July 12, 1879.

Continuation of Injector Experiments.
Wm. J. Williams. July 5, 1879.

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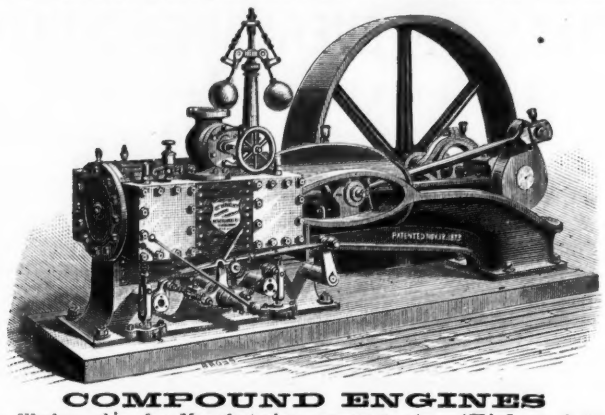

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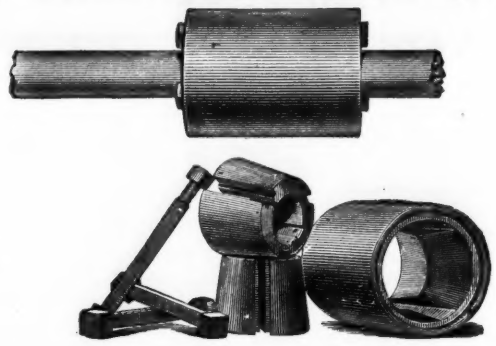

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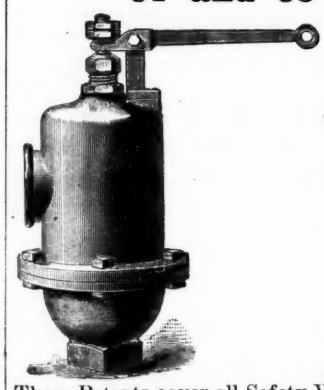

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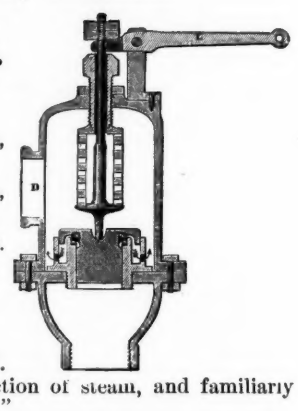

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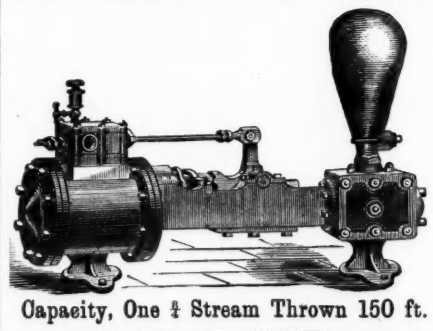

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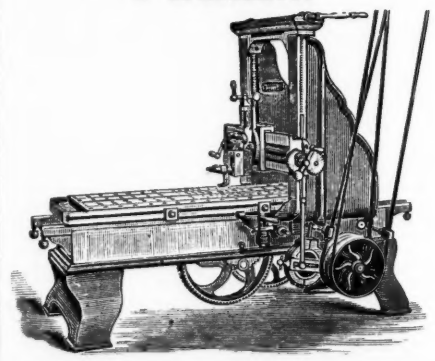

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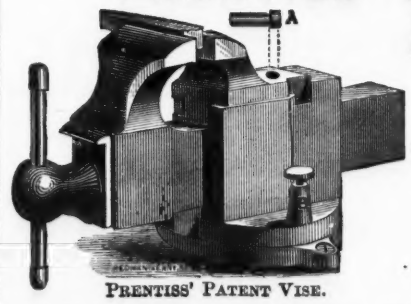

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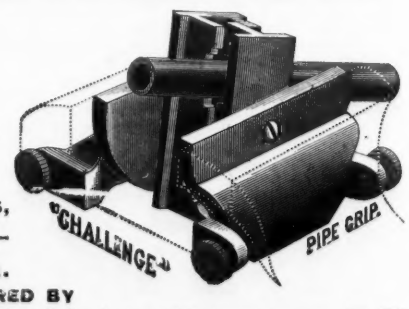

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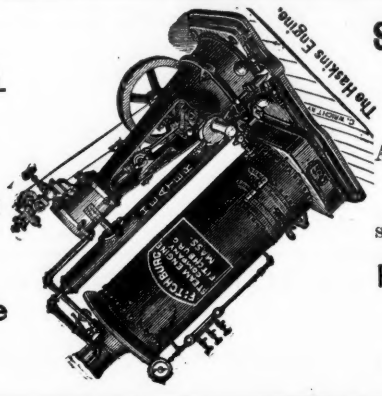

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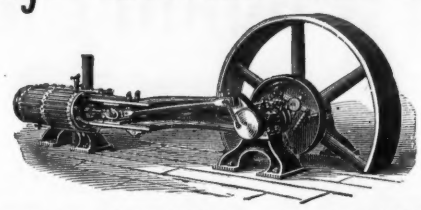

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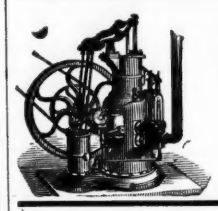

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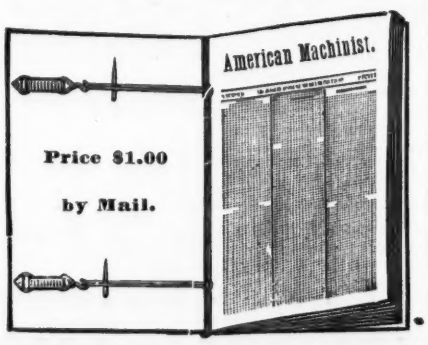

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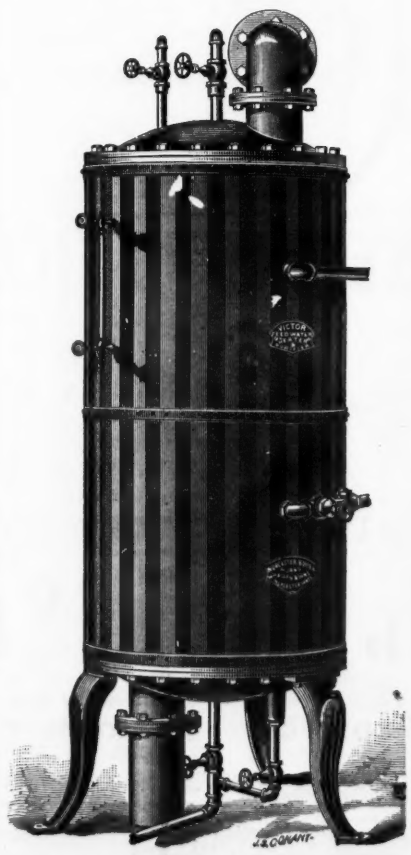

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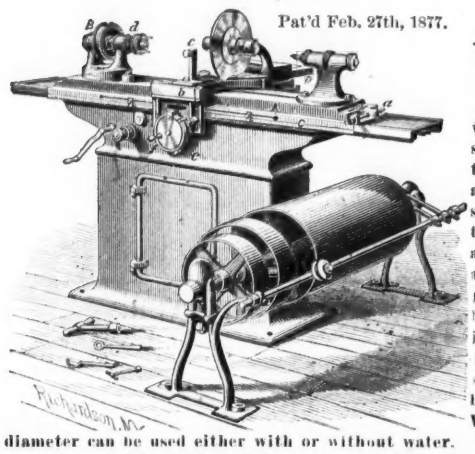

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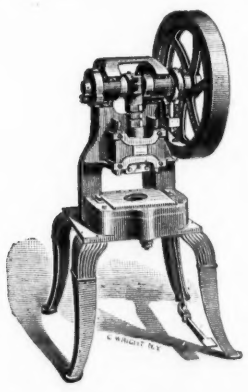

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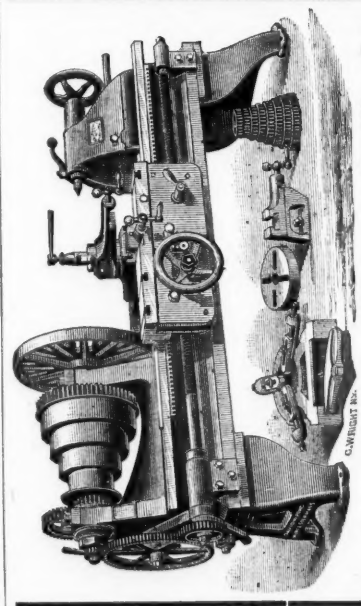

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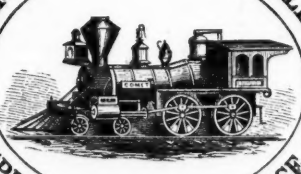

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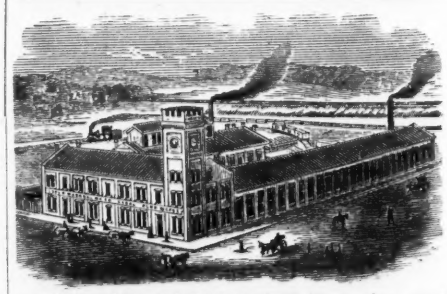

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